

SCIENCE.

FRIDAY, JANUARY 21, 1887.

COMMENT AND CRITICISM.

THE AMERICAN LIBRARY ASSOCIATION is not satisfied with the present apportionment of the public documents. A special committee, headed by Librarian Samuel S. Green of Worcester, Mass., has addressed a communication to the senate committee on printing, enclosing the draught of a resolution, which, if favorably acted upon, will satisfy their wants. The resolution provides that "the public printer shall deliver to the Interior department a sufficient number of copies of the *Congressional record* (bound), 'statutes-at-large,' and of every other government publication, not already supplied for this purpose, printed at the government printing-office, including the publications of all bureaus and offices of the government, excepting bills, resolutions, documents printed for the special use of committees of congress, and circulars designed not for communicating information to the public, but for use within the several executive departments and offices of the government, to enable said department to supply a copy to every depository of public documents designated according to law." The association also believes it would be well if copies of some of the public documents of greatest interest could be sent to such public libraries, not depositories, as have more than a minimum number of volumes, — say, 5,000 or 10,000. It is urged that the expense need not be large, for fewer than five hundred copies would be needed, and there would be no charge for composition, but only for paper, binding, and press-work. There is a great deal of force in this suggestion, and we should be glad to see it receive legislative sanction. Every year our public documents become more valuable, and a larger number of them are of general importance. The reading public should have free access to these volumes at convenient centres of population, and the plan of the library association would accomplish this.

A GREAT MASS of detail of much interest to the students of university organization and work is contained in a recent parliamentary return con-

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cerning the universities of Oxford and Cambridge. It is of most general interest to know what salaries celebrated professors receive, how much lecturing they are required to do, and how many hearers they have. On all of these heads the return is very full and explicit. At Oxford Canon Driver, regius professor of Hebrew, gave in 1885 a hundred and five lectures to classes of from fifty to sixty students. His salary is £1,500. Professor Bryce of the chair of civil law delivered twenty ordinary and two public lectures. No record was kept of the attendance. Professor Bryce's salary is £435. Professor Sylvester, Savilian professor of geometry, gave forty lectures to fourteen students. His salary is £700. Prof. E. B. Tylor, the anthropologist, receives £200, and lectures eighteen times to about twenty-five hearers. Prof. Benjamin Jowett, the Hellenist, receives £500 per annum, and did not lecture in 1885, as he was vice-chancellor of the university. Prof. A. H. Sayce had only from three to sixteen hearers for his lectures on comparative philology. He receives £300. The professor of moral philosophy, William Wallace, receives £400 a year, and has from forty-eight to seventy students at his twenty-eight lectures. Professor Freeman keeps no record of the number of his hearers. His salary is £700, and he gives forty-two lectures during the academic year.

At Cambridge things are not very much different, but we may cite a few examples for the sake of comparison. Canon Westcott, professor of divinity, has a salary of about £800. He gave in 1885 sixty-six lectures, and his audience varied from ten to three hundred and fifty. Professor Stokes, of the chair of mathematics, receives £470, and delivers forty lectures to about eight students. The Knightsbridge professor of moral philosophy, Henry Sidgwick, has £700, and delivered eighty-seven lectures to from four to twenty hearers. Professor Darwin, of the chair of experimental philosophy, gave forty lectures, and had eighteen students. His salary is £580. The professor of modern history, J. R. Seeley, has an income of £371, and gave one lecture a week for two terms, averaging ninety hearers. He had, in addition, sixty ladies who were preparing for the university

examinations. Prof. Arthur Cayley only mustered two hearers to his twenty lectures. His salary is £471. Michael Foster, professor of physiology, has a salary of £800, and gives three lectures a week to about one hundred and sixty students.

These are simply a few figures selected at random, but they furnish food for reflection on more than one point. We find the salaries in almost every case to be sufficient to furnish a fair living, and in some instances generous. But the number of lectures falls considerably below that which it is usual for a professor to give in this country, and the classes are smaller. But it is just these conditions that afford time and opportunity for original scientific research and literary activity. It is just here that the continental universities, and in an almost if not quite equal degree Oxford and Cambridge, have a great and manifest advantage even over our largest and best-endowed universities. We compel our professors to teach and lecture so much, that they cannot write as often and as wisely as their abilities would justify them in doing. The question, 'Why do you not write something?' which is so often put to the already overworked professor, is peculiarly galling. He wants to write something, and feels that he can do it well; but the demands of his routine forbid. Even his vacation season must be wholly spent in regaining strength and vigor for the next year's work. To a certain extent we are in this matter victims of circumstances. Just at present no escape is perhaps possible.

But in some few instances at least, where financial conditions permit a better state of things, public opinion and governing boards are to blame. They value a professor according to the number of lectures he delivers and the number of students he attracts. They fail to perceive that scientific research is the peculiar duty, and should be the peculiar privilege, of the university professor. Oxford and Cambridge professors do more original work than our professors, simply because they are given the time for it. To work an effective reform in this matter will take some time. Our universities must not only accumulate resources, but public opinion and boards of trustees must be educated to see that a professor is not being permitted to do his full duty if he is compelled to teach from ten to fifteen hours per week.

NUMEROUS STATE teachers' associations held their annual meetings during the leisure period afforded them by the time-honored two-weeks Christmas vacation. It is almost invidious to single out any one of the number for special comment; but the meeting of the New Jersey teachers at Trenton was so large and enthusiastic, that some notice should be taken of the great growth of the idea that teaching is a profession that is observable in that state. New Jersey teachers have long borne an enviable reputation for earnestness and ability, but the development of the professional idea among them is of comparatively recent date. The successful establishment of a state reading-circle, which now numbers nearly two thousand members, is evidence of the gratifying progress that has been made; and the attendance at Trenton this year was such as to convince the most sceptical that great good was being done. As the result of the general acknowledgment that teaching is a profession, we naturally expect to see a sense of the homogeneity of all branches of teaching arrived at. Every detail should interest all, for it is a part of the one whole. The Trenton meeting afforded abundant evidence that this fact was appreciated. The programme, though long and varied, commanded attention and interest throughout. Papers were read or addresses given on musical education, penmanship, the education of the deaf and dumb, the status of the common school, character-building, the Delsarte method of expression, and the scientific treatment of education. Varied as these topics were, both in subject and in manner of treatment, they had a unity of thought and purpose, and, what is quite as important, the audience of teachers appreciated the fact. Meetings such as this was are an incalculable help to the earnest teacher, and we are glad that they have taken their place as an essential element in our educational organization.

ARCHEOLOGICAL STUDIES have taken a new start at Harvard. At the quarter millennial celebration last November, one of the foreign delegates who was honored with the highest degree was Professor Lanciani of Rome, the director of the government explorations in the 'eternal city.' Immediately after the celebration he began, in Sanders theatre, a series of eleven lectures on Roman archeology, which were very well attended, though the same course was given at the same time before the Lowell institute, in the neighboring city of Boston. This course was scarcely

closed, when it was announced that Dr. Waldstein, who delivered a lecture a fortnight ago on scientific methods in archeology, was to give a course next March; and now Prof. A. L. Frothingham, recently of Johns Hopkins and now of Princeton, is delivering a series of five lectures on Assyrian archeology. While so much activity has thus been shown in the different fields of classical archeology, prehistoric archeology has been more fully recognized in the appointment last week of Mr. F. W. Putnam, the curator of the Peabody museum, well known for his careful researches in American mounds and other remains, to the Peabody professorship of American archeology and ethnology.

PROFESSOR CALDERWOOD'S short paper in the *New Princeton review*, on the present status of philosophy in Britain, is exceedingly clear and satisfactory. And, coming from a man who has taken so active a part in the philosophical controversies of the last quarter of a century, it is rather surprisingly judicial in tone. Professor Calderwood starts with Hume, and briefly shows the course the reaction against him has taken in Great Britain, France, and Germany. He outlines the rise of the experiential philosophy in Great Britain, and indicates its present points of weakness. He also shows why Kant and Hegel have found so large a following among English students of philosophy, but claims that in Great Britain, as in Germany, Hegelianism has lost its grip, and that there is a marked return to Kant for the purposes of further exposition and criticism. The outlook for the future, Professor Calderwood views optimistically. We are to be tied down neither to bare experientialism nor to unintelligible rationalism. The British philosophy is to draw what is best and truest from both schools in the formulation of a philosophy of certainty. "The thought of the nation is in a transition stage, preparing for a new advance; and, when this comes, it promises to be the fruit of all that is best in German and British thought, and in its nature a further clear advance toward a philosophy of human knowledge,—a philosophy of certainty."

IN HIS ANNUAL REPORT to the New York state legislature, Superintendent Draper states that between three and four thousand public-school teachers drop out every year, and that the large majority of the vacancies thus created are filled

by the appointment of persons without any experience in teaching or training for it, and very many of whom have no intention of teaching permanently. This is a great evil, and, as things are at present, cannot be adequately corrected, though mitigation seems possible. The proper remedy would be to hold in reserve a certain number of persons of normal-school training, who could be at once appointed to such vacancies as they might occur. The objection to this plan would be the expense attendant upon it, and the uncertainty as to just how many vacancies would occur annually. The expense would be something, to be sure; but it would be the cheapest way of saving thousands of school-children of tender age from the disturbing influence of 'quack' teachers. And a table of statistics kept for a few years would give an average annual number of vacancies that would be sufficiently accurate for all practical purposes. Even at some expense and trouble, this evil of foisting unfit and untrained teachers upon the schools should be speedily done away with.

ONE CHAPTER in Professor Payne's 'Contributions to the science of education,' which we notice in another column, has excited a great deal of angry criticism in some of the school-journals. That chapter is the one in which Professor Payne pays his compliments to the maxim, 'Proceed from the known to the unknown,' and denominates it a piece of educational cant which is accepted because it saves the trouble of thinking. Some of Professor Payne's critics have been firm but mild, while others have worked themselves into a great state of excitement, and have saluted his chapter as a voice from mediaeval darkness, and classed him as a pedagogical and psychological ignoramus. We are disposed to think that Professor Payne is partially right, but, on the whole, wrong. His contention that definitude is a late and not an early step in the elaboration of knowledge is well founded, but it does not logically follow that on that account progress is from the unknown to the known. If it were so, we should have no starting-point. The process of acquiring knowledge would be the addition of an indefinite number of zeros. Instruction must arouse some answering chord in the pupil's mind, and, so far at least, the subject of the instruction must be known, and not unknown. But that this fact will not bear all the interpretations so often put upon it, is also true. In any event, Professor

Payne need not be personally denounced for holding an opinion at variance with that of some other educators.

MESSRS. GURNEY AND MYERS have replied, in the January issue of the *Journal of the Society for psychical research*, to the criticisms made upon the literary committee, of which they are the executive officers, by certain members of the society. These criticisms were based upon the fact that the literary committee had not officially examined certain evidence for the so-called 'physical phenomena' of spiritualism. In reply, the secretaries state that they had to begin somewhere, and that two good reasons existed for selecting, as the first subject for consideration, the phenomena known as cases of 'spontaneous telepathy,' the discussion of which is so large a part of their lately published book, 'Phantasms of the living.' The first reason was that these phenomena seemed to connect themselves in a natural way with the results of experimental thought-transference, the investigation of which had been undertaken even before the formation of the society. The second reason was that a very large proportion of the answers received by the committee in response to their public appeal for evidence of psychical phenomena dealt with cases of spontaneous telepathy. So, that this subject should come first in the work of the committee was perfectly natural.

The secretaries further urge that it is not to be forgotten that the evidence in the cases of 'physical phenomena' of spiritualism is distinguished from the evidence in the case of spontaneous telepathy, automatic writing, mesmerism, and so forth, by some radical differences. In the first place, the alleged phenomena have been, for the most part, observed in the presence of professional mediums, persons having a pecuniary interest in their production. The evidence has no longer to do with the validity of perceptions, but with the validity of inferences, with the correctness of the interpretation of subjective impressions. Furthermore, this evidence differs in form from that in the other topics dealt with by the committee. It does not consist of records sent in manuscript to the committee, and previously known but to a few persons; but most of it has already been published in periodicals and in books. Much of the evidence, too, is offered by persons of no training in the kind of observation required, and

of no special aptitude in the arrangement of tests. On all of these grounds the literary committee feels that the sifting and criticism of this evidence is a task beyond their normal functions, and state that a special committee is forming to which all such evidence is to be referred for investigation and report.

WE ARE THOROUGHLY PLEASED to learn, that, at the recent meeting of the Massachusetts state teachers' association, the peddling of text-books and school-journals was prohibited. The ambitious agents of school publishers and journalists have infested state and county association meetings so often in the past, that they thought themselves perfectly secure in the enjoyment of their privileges. But some firm hand has put a stop to the practice in Massachusetts, and we trust the example will be generally followed. Legitimate advertising is commendable, and an agent is to be praised rather than blamed for his assiduity. But the publishers of text-books and school-journals have carried the thing so far that they interfere largely with the regular work of a teachers' association meeting. It is not the use of the privilege, but its abuse, that we decry; and we want to see plenty of imitators of the independent stand taken in Massachusetts.

THE AIMS OF GEOGRAPHICAL EDUCATION.

Mention all the names of places in the world derived from Julius Caesar or Augustus Caesar.

Where are the following rivers: Pisuerga, Sakaria, Guadalete, Jalon, Mulde?

All you know of the following: Machacha, Pilmo, Schebulos, Crivoscia, Basecs, Mancikert, Taxhen, Citeaux, Meloria, Zutphen.

The highest peaks of the Karakorum range.

The number of universities in Prussia.

Why are the tops of mountains continually covered with snow (*sic*)?

Name the length and breadth of the streams of lava which issued from the Skaptar Jokul in the eruption of 1783.

THE above table, taken from Professor Ravenstein's lecture before the Royal geographical society,¹ is very probably a combination of the more atrocious questions on several examination-papers. It none the less will serve as a text for our paper; and this because it fairly represents the ideas of certain so-called 'teachers of geography' as to the limits of the science they were attempting to teach. To them geography simply meant the cramming into a child's mind so many isolated facts, so many heights of mountains, so many lengths of rivers, so many names of places,

¹ *Royal geographical society, report of the proceedings of the society in reference to the improvement of geographical education.* London, Murray, 1886.

most of them of no possible importance to the student. Indeed, so far and wide has this erroneous idea of geography spread, that there are books actually made for the purpose of teaching this sort of thing. For instance: there is a compiler who has been known to assert, and to assert with pride, that, by the use of his book, one might learn the names of seventeen thousand places in the course of a few years. Just as though there were any object in one's turning one's self into a walking gazetteer, when gazetteers in plenty could be found on the shelves of a neighboring library! In fact, one is irresistibly reminded of the paragraph in the introduction to Mrs. Green's 'Short geography of the British Islands,' the introduction being the work of the brilliant writer, though inaccurate historian, the lamented J. R. Green. He says:—

"No drearier task can be set for the worst of criminals than that of studying a set of geographical text-books, such as the children in our schools are doomed to do. Pages of 'tables,'—'tables' of heights and 'tables' of areas, 'tables' of mountains and 'tables' of tablelands, 'tables' of numerals, which look like arithmetical problems, but are really statements of population,—these, arranged in an alphabetical order or disorder, form the only breaks in the chaotic mass of what are amusingly styled 'geographical facts,' but which turn out to be simply names,—names of rivers and names of hills, names of countries and names of towns,—a mass rarely brought into grammatical shape by the needful verbs and substantives, and dotted over with isolated phrases about mining here and cotton-spinning there, which pass for industrial geography. Books such as these, if books they must be called, are simply appeals to the memory: they are handbooks of mnemonics, but they are in no sense handbooks of geography."

This, of course, applies more particularly to British geographical text-books. But, so far as the present writer can see, the same remarks are applicable to many of our most popular (with the teachers) text-books. That this is so, is no reflection on the teachers: it is the fault of their early education. And for this our college and normal school authorities are more especially responsible. The evidence that improvement in such respects must come from the university downwards seems to be irresistible. Nor should the publishers be blamed. If they could see the evidence of the demand for better school-books,—books that were not miniature gazetteers,—they would undoubtedly supply it. I remember only a year ago taking a set of the best and most popular school-maps made in Germany to a well-known and enterpris-

ing publisher of text-books. I suggested that perhaps some arrangement could be made with the German publisher by which the maps could be adapted to the use of English-speaking scholars. The gentleman very frankly replied that he could not sell a set of the maps, even if the names were in English. He added, that our people wanted maps colored differently; that is, so as to obscure the physical features. A short time afterwards the same publisher brought out a set of maps of the United States with little angles marked on them so that the scholars could draw the state lines with accuracy, as though that was the end of geographical education. But it was not his fault. His business was to supply the demand, not to get out good maps.

If the learning of seventeen thousand names 'in a few years,' or the 'bounding' of countless states, or the making of maps that will look well on exhibition, is not the end of geographical teaching, what is the use of teaching it at all? What is the aim of geographical education?

In the first place, geography, properly studied, gives one a clear and accurate knowledge of the physical conformation of the earth's surface. This is physical geography, and should be studied first. But this is not the mere learning of 'tables of heights,' etc. It is something entirely different. One may have a very good knowledge of the formation of the earth, and yet be densely ignorant of the height of the Karakorum range. And, as a general rule, the less of such stuff crammed into a child's head, the more physical geography he will know. He should rather be taught to observe phenomena. It is true that such knowledge is hard to get at on examination; but that is not so much the fault of the knowledge as of the examination. Then the flora and fauna of each region of the earth's surface should be properly associated in a child's mind. In this connection, it may be said that nothing is less calculated to convey this knowledge than the ideal or 'model landscapes' too often to be found in our school-rooms. Geography aims also to teach the influence of geographic factors upon the development of the human race. This influence is frequently exaggerated. But the working-out of such problems, even on insufficient data, must have a stimulating effect upon the mind. It may be said that the teaching of the distribution of the flora belongs rather to botany. So undoubtedly any detailed study of the various floras does belong to botany. But a knowledge sufficient to enable one to assign to any given region its appropriate plant-life, and to trace the influence of that floral environment on man, is surely within the domain of geography.

As one of the most important aims of the real teacher of history is to instruct his pupils in the use and making of historical works, so in geography one of the most important things is the teaching of the use and construction of maps. And it may be said, that to the student of history or of geography, to the traveller or military commander, the ability to read a map is next in importance to the ability to read a book. And it is something not easily acquired. It may be said that there can be no difficulty in distinguishing a river from a mountain. And very likely there is none; but such knowledge is no more map-reading than the distinguishing a from x is book-reading. Nor is map-making cartography. To some minds the two seem inseparable; and the student is required to draw a map with the nicety of a practised cartographer, under the pretence that he is learning geography. He is doing nothing of the kind. The ability to go out of doors and make a good working sketch of the surroundings of one's own school-house is of more value, geographically speaking, than the ability to construct, from sketches and details of survey, a map of Cape Cod with all the accuracy of a Swiss cartographer. No one confounds the art of writing and that of printing. Then why should he confound the describing geographical features with geographical symbols and reproducing the same with the greatest accuracy for permanent use? Geography is not cartography, nor is it topography, although both these elements combine in geography. Properly taught, map-drawing is the best guide to map-reading.

To sum up the aims of geographical education, or perhaps I should say its only aim, is to make men understand what is going on around them,—to converse intelligently upon the present crisis in Bulgaria, or the economic changes which will be wrought by the Panama canal, if it is ever opened; to travel abroad with some degree of satisfaction to one's self, and to one's readers if one writes a book; to read with interest and appreciation articles on campaigns, like those now appearing in the *Century*. For what information can a map, accurately drawn with contour-lines or hachures, convey to a man who does not know what those symbols mean? And, finally, the student of modern history who is not familiar with the geographical features of western Europe can gain only a very dim idea of what the everlasting changes of boundary really mean. The marked difference between the books now being produced by French, English, and American travellers, on the one hand, and German explorers, on the other, is too great to escape attention. That difference is due entirely to the fact that in school and uni-

versity the German is taught, in the first place, to see, and, in the second place, to understand what he does see. This power (for such knowledge is power) is fast pushing the German to the foremost place in war, in commerce, and in exploration. If he could also be taught to relate in clear and simple language what he thus has learned, it would be a positive gain to mankind.

EDWARD CHANNING.

AMERICAN SOCIETY FOR PSYCHICAL RESEARCH.

THE society held its annual meeting at the rooms of the Boston society of natural history on Jan. 11. The auditorium was crowded, it having been announced that there would be shown some 'apparent thought-transference' and some muscle-reading.

The thought-transference was performed by Dr. Minot, with the assistance of Mr. C. B. Cory, and was designed to show the character of the dangers arising from fraud introduced into experiments on mind-reading, similar to some of the experiments made by the committees of the English society for psychical research. The audience were at first not informed of the ultimate purpose of the experiments, and were for the most part entirely deceived, although many were suspicious. Several persons took a card, and, having fastened their attention upon the card, they approached Dr. Minot, who proceeded to draw it upon the blackboard without having seen the card. There were two failures, one of which was partial only, and two successes. Later in the evening Dr. Minot explained that the experiments were fraudulent, and had depended upon Mr. Cory's skill in card-forcing, so that the persons had not really chosen their cards, but had taken them from Mr. Cory. It had been arranged in what order the cards should be given, so that every one was known to the *mind-reader*, and his failure-drawings were intentional blinds. The signals used to indicate what person was coming were also described. Dr. Minot then added a few words, which made clear the lesson intended; namely, that in many of the English experiments, which offer the only evidence worth heeding, of thought-transference, there existed evident opportunities for fraud, and that therefore the experiments in question are inconclusive. He expressed his unwillingness to believe in thought-transference in consequence of the evidence yet presented, and his hope that the amusing demonstration made by Mr. Cory and himself would serve the serious and grateful purpose of emphasizing the dangers of credulity in these matters.

Entirely straightforward were the very admirable performances in muscle-reading by Mr. Charles H. Montague, a gentleman who, in the course of a few weeks' practice, has acquired an extreme skill. He first repeated a mock murder, similar to the repetition recently achieved by Bishop and noticed in our columns (*Science*, viii. p. 506). He then accomplished another feat, that of reconstituting a tableau, which had been arranged by Prof. W. T. Sedgwick while Mr. Montague was out of the room. When he returned, he took hold of Professor Sedgwick's hand, and quickly found the persons and objects, and placed them in the proper positions quite exactly. All of this was done by muscle-reading; and, in reply to a question from one of the audience, Mr. Montague said that mind-reading had nothing to do with his obtaining the requisite information from the subject.

The various committees made brief reports of progress, that of the committee on apparitions being the most interesting, several remarkable cases being read by Professor Royce, who closed his suggestive remarks by stating that the committee was desirous of accumulating a much more extensive material.

The chairman, Dr. Bowditch, called attention to the fact that the society, in order to employ a qualified secretary and meet the expenses of its work, requires at least two thousand dollars, about half of which has already been raised. Under these circumstances, the council had regarded it as safe to engage the service of Mr. Hodgson, who had agreed to come. Mr. Hodgson is well known by his thorough exposure of the Indian theosophical society and the frauds of Madame Blavatsky. The society has hitherto been at a disadvantage, because its leading members have been so pressed by professional duties that they have been able to give very little time to the active work of the committees. But, if the funds which the society asks for are secured, it will be enabled to prosecute its various researches into psychic phenomena with activity as well as zeal.

An appeal to all those interested in the objects of the society to help contribute to the balance of the required sum has been issued by the council, Henry P. Bowditch, Charles B. Cory, George S. Fullerton, Edward G. Gardiner, E. H. Hall, G. Stanley Hall, Charles C. Jackson, Joseph Jastrow, William James, Charles S. Minot, Simon Newcomb, E. C. Pickering, W. H. Pickering, James M. Peirce, Josiah Royce, Minot J. Savage, Samuel H. Scudder, Coleman Sellers, R. Pearsall Smith, William Watson. Subscriptions should be sent to C. C. Jackson, 24 Congress Street, Boston.

We trust that the society will expand its scope,

and turn to the solution of some of those problems of psychology which press on every side for solution. We are therefore glad to learn that a committee on experimental psychology has been appointed.

GOVERNMENT SCIENTIFIC WORK.

THE work upon the report of the Charleston earthquake, to be made by Captain Dutton of the U. S. geological survey, is progressing rapidly. The data collected are very voluminous, and of a character which is quite as satisfactory as could reasonably be expected. The number of separate reports, amounting to about twenty-five hundred, have been card-catalogued, and the plotting for isoseismals has begun. The data are less satisfactory than could be wished, although a few reports of the time of the passage of the earthquake shock in various parts of the country will be sufficiently accurate to determine the velocity of propagation of the earth-wave, and with a much smaller probability of error than in any other earthquakes previously reported. The final computations have not as yet been made, but sufficient is known to indicate with certainty a velocity somewhat in excess of three miles per second. The data relating to the epicentral localities and their immediate neighborhood are quite full, and it is expected they will prove instructive and suggestive. Captain Dutton is reluctant to speak very decisively about the final results, believing that any very specific statements would, for the present, be premature.

Prof. Raphael Pumpelly, chief of the division of archean geology, who has been on the temporary roll of the U. S. geological survey, has been placed on the permanent roll, in consequence of the resignation of Mr. F. V. Hayden.

The question of successorship to General Hazen is being discussed. Captain Greely is most likely to succeed to the position of chief signal officer. He will at least remain at the head of the service temporarily, until arrangements are perfected for separating the weather-bureau from military control, and establishing it permanently under a civil branch of the government. General Hazen was quite opposed to any such transfer, but changed his mind about six months ago. This leaves the matter now open; and, as no officer of high rank would be affected by the change, it will probably be made. None of the officers of the service would offer any opposition to the movement.

Another important step has been taken in the permanent exposition project in Washington, the select committee of the senate having reported in

favor of commemorating the centennial of the constitution at Washington in 1889. The committee has not reported upon the manner of the proposed celebration, and also in regard to the quadri-centennial of 1892; but the action now taken furnishes sufficient assurance that the entire programme as contemplated by the board of promotion, and including its exposition features, will receive the indorsement of congress.

The department of agriculture estimates of area, product, and value, of corn, wheat, and oats for permanent record, are completed. The corn-crop, in round numbers, aggregates 1,665,000,000 bushels, grown on 75,000,000 acres of land, and has a farm value of \$610,000,000. The yield is 22 bushels to the acre, or $4\frac{1}{2}$ bushels less than last year. There is an increase of area of over 3 per cent, and a decrease in product of 14 per cent; while the average price has increased 12 per cent, or from 32.8 to 36.6 cents per bushel. The aggregate product of wheat is 457,000,000 bushels from an area of nearly 37,000,000 acres, having a farm value of \$314,000,000. The average value is 68.7 cents per bushel, against 77.1 for the previous crop, and 64.5 cents for the great crop of 1884. This is 35 per cent reduction from the average value between 1870 and 1880. The product of oats is 624,000,000 bushels, 5,000,000 less than last year, from an average of over 23,000,000 acres, producing a value of \$186,000,000. The average yield is 26.4 bushels against 27.6 last year. The average value is 29.8 cents per bushel; last year, 28.5 cents.

An effort is being made in Washington to secure the hall of the house of representatives for the opening session of the ninth triennial meeting of the International medical congress on the 5th of next September. About two thousand delegates are expected, including some three hundred from Europe. After the opening meeting the congress will be divided into seventeen sections, meeting in the different halls of the city.

An invitation has been received at the department of state, asking the government to appoint a delegate or delegates to the Fourth international prison congress, to meet at St. Petersburg in the year 1890. The President transmitted a message to congress on this subject last week, favoring the appointment of delegates, and they will probably soon be named.

The following bulletins of the U. S. geological survey are now in the hands of the printer: 'Physical properties of iron carburets,' Barus and Strouhal; 'Subsidence of small particles of insoluble solids in liquid,' Barus; 'Types of Laramie flora,' L. F. Ward; 'Peridotite of Elliott county, Ky.,' J. S. Diller; 'The upper benches

and deltas of the glacial Lake Agassiz,' Warren Upham; 'Fossil faunas upper Devonian Genesee section,' H. S. Williams; 'Report of work done in chemical division U. S. geological survey during fiscal year 1885-86,' F. W. Clarke; 'On the tertiary and cretaceous strata of the Tuscaloosa, Tombigbee, and Alabama rivers,' E. A. Smith and L. C. Johnson; 'Historical sketches of general work in Texas,' R. C. Hill; 'Nature and origin of phosphates of lime,' R. A. F. Penrose, jun.; 'Bibliography of American Crustacea,' A. W. Vogdes.

NOTES AND NEWS.

THE literature of spiritualism has recently been increased by an historical sketch of the subject by Dr. Paul Gibier ('Le spiritisme,' etc., Paris, 1887). The author is not a spiritualist, and takes great pains to state his disbelief in the supernatural in big letters. As a further guaranty of the scientific spirit which prompts his inquiry, he appends a list of his contributions to medical science. For the most part, Dr. Gibier contents himself with the rôle of historian. He gives a rapid sketch of the spiritual theories from the ancient Hindoos down to the researches of Crookes and Zöllner. His account of the modern developments in this strange field is quite convenient and readable. An outsider would hardly credit the statement that in Paris (by no means a stronghold of spiritualism) there are not less than 100,000 spiritualists. The statistics of the periodical literature of spiritualism is also astonishing: 13 such periodicals are in French, 27 in English, 36 in Spanish, 5 in German, 3 in Portuguese, 1 in Russian, 2 in Italian. Besides, a Franco-Spanish journal is published at Buenos Ayres, and a Franco-Dutch at Ostend. While the main portion of the work is historical, a few chapters are devoted to the account of séances mainly with the famous slate-writing medium, Slade. These have convinced the author that there are genuine facts in these phenomena which spiritualistic hypothesis, as well as current scientific knowledge, is unable to explain. More research is necessary before the final verdict can be given, and it is cowardly for science to refuse to study all such facts, and seek their explanation.

—The Indiana state teachers' association began its annual meeting in Indianapolis Dec. 28, extending its sessions through the two succeeding days. The high school section, and country and village school section, held the sessions on the 28th, and on the other days the association held meetings as a whole. A number of papers were presented in

general session, each supposed to be applicable to the needs of the common schools of Indiana. The following papers were read before the high school section : 'Mathematics as a factor in mind-development,' by J. A. Camagey ; 'Limitations in pedagogical psychology,' by J. R. Hart ; 'Psychology in its relation to English literature,' by A. M. Huycke ; 'Some observations on teaching Latin in the high school,' by George W. Hafford ; and 'Zoölogy in the high school,' by Prof. O. P. Jenkins.

—The *Medical news* contains an interesting statement of the books, pamphlets, etc., in the principal medical libraries of the country. It is as follows :—

	Vol- umes.	Pam- phlets.
Library of surgeon-general's office.....	76,700	106,600
Library of College of physicians of Phila...	34,234	16,026
Library of New York academy of medicine.	20,000	12,000
Boston medical library.....	16,374	13,364
Library of the New York hospital.....	15,860	—
Library of the Pennsylvania hospital.....	15,000	—

—The Bell and Lancaster systems of education, or at least so much of them as relates to the employment of monitors or pupil teachers, have been considered dead. But the *London Journal of education* announces that the Bradford (England) school board has adopted a plan according to which pupil teachers are retained, but on the half-time system, and they are placed during the second half of the time in a central class for instruction under skilled teachers. If pupil teachers are to be retained at all, some such basis as this is the only one on which it should be done.

—Prof. John W. Burgess of Columbia college is to deliver a course of ten lectures at Andover theological seminary during the spring, on 'The influence of the church in modern European history.'

—*Afrikanische nachrichten* is the title of a new monthly, which is published at the press of the geographical institute in Weimar. It is devoted to the extension of information concerning Africa, and will pay especial attention to German interests in that continent.

—The emigration at the German seaports and Antwerp amounted, during the first six months of 1886, to 39,477 persons. For the same period in 1881 it was 126,139 ; in 1882, 117,801 ; in 1883, 94,145 ; in 1884, 90,301 ; in 1885, 63,345.

—An excellent idea may be obtained of what subjects are of greatest contemporary interest to the leading universities abroad by an inspection of the list of lecture-subjects announced. For the

Hilary term at Oxford, for example, the following are some of the courses announced by the leading professors : Professor Bryce announces a course on some leading principles and maxims of Roman law, with illustrations from the Digest ; Professor Dicey, on the law of contract, and on succession to real and personal property ; Professor Burdon-Sanderson, on the physiology of the nervous system ; Professor Sylvester, on surfaces of the second order ; Professor Jowett, on the history of Greek philosophy from Thales to Socrates ; Professor Nettleship, on the history of Latin literature from the earliest times to the end of the second century B.C. ; Professor Wallace, on moral psychology, and on the relations of ethics and aesthetics in German philosophy from Kant to Schopenhauer ; Professor Fowler, on the Aristotelian logic, on the methods of the various sciences, and on the principles of legal and historical evidence ; Prof. Bonamy Price, on free trade and fair trade ; Professor Palgrave, on the sculpturesque and pictorial styles in ancient and modern poetry.

—Mr. Bardeen of Syracuse announces for sale an uncut copy of the 'Orbis pictus' of Comenius. Only one other copy is known to be in America.

—Prof. Max Müller is to lecture at Oxford during the present term on the Vedas.

—We learn from the *Athenaeum* that Professor Bain is about to publish a new and enlarged edition of his 'Rhetoric and composition.' In this edition the author proposes to omit a number of the topics comprised in the existing work, and to bestow a greatly expanded treatment upon points selected on account of their importance as well as their suitability to pupils of a certain standing. In part i. the subjects are, order of words, number of words, the sentence, the paragraph, figures of speech, and intellectual qualities of style. The second part, which will speedily follow, is exclusively devoted to the emotional qualities of style, and is meant to be an introduction to the higher criticism of poetical literature. The first part will be accompanied by a small volume entitled 'On teaching English,' which is partly controversial and partly didactic. It discusses the various methods of English teaching at present in use, and exemplifies the rhetorical method in a series of select lessons. It also handles at some length the vexed question of the definition of poetry.

—Captain Gore of the royal engineers is to construct the new map of Afghanistan from the surveys, reconnaissances, and explorations made by the Afghan boundary commission.

— The healing-springs of Bosnia and Herzegovina seem destined to occupy a prominent place among the health-resorts of the world. Professor Ludwig of Vienna, in the course of an official journey recently, discovered over fifty medicinal springs. The best are those at Banjaluka, Serajewo, and Dolnja-Tuzla.

— According to the newest and best maps of New Guinea, that region, including the small island lying near its coast, has an area of not less than 795,223 square kilometres. Of this territory, 390,560 square kilometres are under Dutch protection, 225,463 under English, and 179,200 under German.

— During the holidays a meeting was held at University college, Toronto, to organize a modern-language association for the Province of Ontario.

— *Modern-language notes* announces that Professor Crane of Cornell university is preparing an extensive work on the great mediaeval collections of Latin stories, their sources and imitations in the modern languages. A large part of the material has been taken from unedited manuscripts in the British museum and National library at Paris, or from early printed books. Among the former class are the *exempla* or illustrative stories contained in the sermons of Jacques de Vitry, bishop of Acre and the historian of the Crusades. Although these stories are of the greatest value for the question of the diffusion of popular tales, they have never before been edited. Professor Crane's work, which is entitled 'Mediaeval story-books and stories,' will cover the entire range of mediaeval Latin fiction, including *contes dévots*, fables, apologues, historical anecdotes, jests, etc., and will be valuable not only to the student of comparative literature and folk-lore, but also to those interested in mediaeval culture and history.

— In order to aid the law-students in the study of the year-books and other legal documents in Norman French, the trustees of Columbia college have provided a lecturer on Norman French for the law-school.

— The December issue of the Johns Hopkins university circulars contains the report of Prof. W. K. Brooks on the Zoölogical work of the university since 1878, and also a series of papers on the work of the marine laboratory during the past summer.

— From time to time the English papers publish reports as to the health of Mr. Herbert Spencer. It is now said to be improving.

— The *Athenaeum* announces that the second volume of Professor Pfeiderer's 'Philosophy of

religion,' now in the press, will include not only many corrections and additions by the author, but also some new matter on the English philosophers of the present day.

— The present series of free public lectures at Columbia college, which it is hoped will become a permanent institution, was opened on Saturday, Jan. 8, by William Henry Bishop, who spoke on 'Characters and dialect in fiction.' Last Saturday Mr. E. A. Nadal lectured on 'Recollections of the south.' Tickets for these lectures are issued because of the limited capacity of the lecture-hall, but they may be obtained free of charge by addressing the registrar, Columbia college.

— Those who have followed the Irish question in British politics, and who have read Mr. Gladstone's 'History of an idea,' will be interested in the presentation of the opposite view by Lord Brabourne. This was first printed in *Blackwood's magazine*, but is now issued separately.

— In the January number of the *Andover review*, Prof. George H. Palmer of Harvard defends his view of the elective system against its critics, and closes the discussion on that subject which has been going on in the columns of the review for a year past.

— 1,800,000 francs have been subscribed to establish the Pasteur institute in Paris. Some of the largest contributions have been received from English brewers, as a token of their appreciation of Pasteur's work in connection with fermentation.

— The New York cremation society, which has its crematorium at Fresh Pond, Long Island, has incinerated eighty-four bodies during the past year.

— M. Peyraud considers one of the best means of determining the death of an individual to be cauterization by Vienna paste. If the eschar forms slowly, and is of a yellow color or transparent, death may be positively declared, while, if it is red, brown, or black, life still exists.

— The following officers were elected at the annual meeting of the Appalachian mountain club in Boston, Jan. 12: president, Prof. Alpheus Hyatt of Cambridge; vice-president, Robert C. Pitman of Newton; recording secretary, Rosewell B. Lawrence; treasurer, Gardner M. Jones. Committees: on natural history, George Dimmock of Cambridge; on topography, Prof. E. E. Burton; on art, Charles W. Sanderson; on explorations, Frank O. Carpenter; on improvements, Isaac Y. Chubbuck. Trustees, Professor William H. Niles of Cambridge, Augustus E. Scott of Lexington,

Charles W. Kennard. It was also voted that the admission-fee be hereafter five dollars.

— Since our last issue two men have died who have been prominently connected with the science of America. The one was Gen. W. B. Hazen, the head of the U.S. signal service, and the other Prof. E. L. Youmans, to whom Americans owe a debt for his successful labors in rendering available to them much of the best scientific thought of the time.

— As is usual, the *Athenaeum* prints in its first January number a series of essays on the continental literature for the past year. The article on French literature is by Gabriel Sarrazin, and contains incidentally a savage denunciation of M. Zola. The article on Germany, from the pen of Hofrath Zimmermann, is as interesting as usual. Arminius Vámbéry writes of Hungarian literature, and R. Bonghi of that of Italy.

— The *Woman's journal* has been emphasizing the well-known fact that female teachers greatly preponderate in this country. To so great an extent is this true, that, in respect of elementary schools, those cities are the exceptions in which male teachers are employed, save as principals, or teachers of some special branch, say, German. Taking the ten cities of Baltimore, Boston, Brooklyn, Chicago, Cincinnati, New Orleans, New York, Philadelphia, San Francisco, and St. Louis together, there are 12,719 public-school teachers, of whom 11,540 are women. The average percentage of male teachers in these cities is 9.

— The entrance of Sir Henry Roscoe upon a political career necessitates the giving-up of his chair at Owens college, Manchester. Mr. H. B. Dixon of Trinity college, Oxford, has been called to succeed him.

— The *Educational times* says that "the friends of education have much reason for rejoicing in the fact that a large number of the memorials which are to render her majesty's jubilee memorable will take an educational form. Technical schools, colleges, and endowments of professorships will be, in many cases, the visible signs by which contemporary English loyalty will be evidenced to unborn generations."

— According to the *Journal of education*, the modern Greeks are, in one respect at least, aiming as high as the ancient Greeks: they are beginning to conquer the world — the world, at any rate, of the east — by culture. A correspondent of the *Journal des débats* gives some account, in this connection, of the great advance which higher education in Greece has made of recent years. There

are 33 gymnasia in the kingdom, 200 secondary schools, and 1,717 primary schools. These are all public. Among the private educational establishments, the first place must be given to the Society for the higher education of women, in connection with which a lycée for girls was established a few years ago, with a staff of 76 teachers and 1,476 pupils. Greeks send their girls there from all parts of the east. Education is very liberally endowed in Greece; and the sums which Greeks settled in foreign countries send home for this purpose are very large. One result, of course, is that the Greeks are almost entirely in possession of the learned professions in Turkey. Illiteracy, too, is rare in the kingdom: in the most out-of-the-way hill countries you will see little scholars reading their Plutarch's 'Lives.'

— The Standard typograph company, whose typograph was described and illustrated in *Science* for Sept. 17, 1886, have published a little pamphlet calling attention to recent improvements in their machine. By the use of 'slugs,' or strips of metal, instead of a single sheet, the lines of type-impressions may be spaced or 'leaded' any desirable distance apart, in the same manner as ordinary type. The use of what is known as 'self-spacing' type, that is, type whose width of face is a certain determinate multiple of an established unit, removes some, though not all, of the difficulty in 'justifying' or spacing uniformly between the words. These two points are decided improvements; but the specimens of work given in the pamphlet show that many of the defects and imperfections previously mentioned in *Science* still remain.

— In lecturing before the Society of natural history at Berlin, Professor Stricker has employed with much success an electric lamp of 4,000 candle-power for the projection of microscopic sections upon a screen, employing a magnifying power of six to eight thousand diameters. It is stated that the definition obtained is very satisfactory.

— In a letter to a London newspaper, Sir Edward Watkins advocates a system of experimental boring, by the British government, with a view to discovering natural gas in England. The many advantages derived from the use of such gas at Pittsburg and elsewhere in Pennsylvania are stated as incentives to the undertaking of such work by the government.

— A new type of submarine torpedo-boat is being experimented with at the West India docks, London, England. The peculiar feature of the boat is the means adopted to secure immersion or flotation, which consists in increasing or reducing

her displacement by projecting or withdrawing telescopic chambers in her sides, instead of pumping water into or out of ballast tanks, the method usually followed in similar boats. The boat is spindle-shaped, 60 feet long and 8 feet in diameter amidships, built of $\frac{3}{8}$ -inch steel, and is propelled by an electric motor of 45 horse-power, current being furnished by storage batteries.

LETTERS TO THE EDITOR.

*.*Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Popular science.

It is often very popular indeed. Here is an article on the voices of animals by Detler von Geyern (whoever he is), from *Ueber Land und Meer*, translated for the *Popular science monthly*, January, 1887, written in the good old traditional vein, quoting what anybody has said on the subject in a wonder-mongering way, as if every thing said and written must be true. And Herr von Geyern himself says, "Fish can produce no sound in water, because air is lacking as a medium to propagate the waves of sound; and yet we incline to the belief that water itself may admit of forming some kind of sound-waves which the fish may be capable of exciting, and which will be experienced and comprehended by other fish;" and he adds, "As far as we are concerned, of course, fish will remain mute," etc.—as if between fifty and a hundred species of fish are not known to make sounds, many of which have been described and explained by naturalists; and as if water and every other elastic medium were not well known as propagators of sound, often better than air,—a fact familiar to boys, who hold their heads under water, while bathing, to hear the loud sound made by the striking-together of two stones under water in the hands of a companion at a little distance.

H. W. P.

Grinnell, Io., Jan. 14.

The natural method of language-teaching.

I read with much pleasure the recent article of Professor Carpenter on the natural method of teaching languages. Such articles are in the direct interest of truth, and therefore of science; for the more the claims and achievements of the teachers of these methods are scrutinized, the more evident their weakness becomes. Every intelligent teacher knows that there is little if any thing really new in any of these methods, and every good teacher of languages has employed several, if not all, of their varieties and sub-varieties, each of which is superior to the others in the opinion of their self-styled inventors. We are safe in assuming that the natural method of learning a foreign language is at least as old as the time of Cain, for it is both probable that he learned the language of the people of Nod, and that he used neither grammar nor dictionary.

I believe, that, in the main, great improvements have been made recently in the teaching of languages, but not greater than, or even so great as, in the natural and physical sciences, as they are commonly called. For some reason the teachers of the last two have either been more modest in proclaim-

ing their progress, or they have been more generally aware that they are only employing methods that the best teachers in these departments, as in all others, have been using to a greater or less extent ever since the birth of science.

Several years ago I took considerable pains to examine, both at first-hand and at second-hand, the claims of several of the most widely known teachers of natural methods as applied to foreign languages. I then made some statements that agree almost verbatim with those made by Professor Carpenter. In spite of the well-established fact of every-day experience, that the adult is able to retrace but very imperfectly the psychological experiences of his early years, we are told that all persons, no matter how old, should, if desirous of learning a foreign language, proceed exactly in the same way that they learned their mother-tongue. This is the inductive method run riot, while experience and generalization count for nothing. To me the best refutation of the claims of most teachers of natural methods lies in the fact, that, while professing to be able to teach us to "read, write, and speak their vernacular correctly in an incredibly short time," I have not yet found one or heard of one who spoke English more than passably, even after years of practice. Shall we say, 'Physician, heal thyself'? or shall we excuse their shortcomings for the reason that 'physicians never take their own prescriptions'? CHAS. W. SUPER.

Athens, O., Jan. 16.

Stereoscopic vision.

The letters in the last two numbers of *Science* (ix. Nos. 204, 205) in relation to stereoscopic vision lead me to ask if any of your readers have ever tried the experiment of viewing a stereoscopic picture with the naked eye, and, by changing the focal distance, or visual angle of the eyes, so adjusting them, while looking at the picture, or, more properly, the two pictures, that the full stereoscopic effect is produced, and all parts of the picture stand out distinct, and in as bold relief as when seen through the two glasses. The first effect of the change of the visual angle, from the paper on which the pictures are imprinted to a more distant range of vision, is to double the number of the pictures, four now coming into view. The two inner ones overlap more or less, and slide over each other to right and left, as the visual angle undergoes alteration, until finally, when the proper adjustment is reached, the two pictures coincide in all their parts, coalescing, as it were, like two drops of water or two globules of quicksilver when they meet and run together. And now there are three pictures in view, and the eyes may be turned about from one point to another, and any part or particular object in the picture minutely inspected in any one of the three copies. The central picture is the most clear and distinct, being held in view by both eyes, while the two outer ones are respectively visible to only one eye.

W. W. ANDERSON, M.D.

Stateburg, S.C., Jan. 13.

An electric ball of fire.

In the summer of 1881 it was my good fortune to observe some electrical phenomena in the way of 'globular lightning,' which differ, I think, in some respects, from any other case on record. It consisted of a ball of fire which rolled down an iron water-

pipe, which pipe enters the room at a height of about ten feet, and, passing downward, ends in a faucet over a zinc-lined sink, the sink being connected by a pipe with the ground. The ball of fire was about an inch and a half in diameter, of a semi-transparent bluish color, giving a feeble light, which first appeared at the top of the pipe, and rolled down it at a nearly uniform velocity of six or eight feet per second, and, upon reaching the faucet, fell into the sink with a report about as loud as the discharge of a gun-cap. We at once examined the sink, but found no trace of any thing. But, as we stood watching the pipe, the same phenomenon was twice repeated, making three discharges in the course of ten minutes.

This occurring, as it did, five years and a half ago, I am unable to give as accurate an account as I might wish. There were twelve or fifteen persons in the room at the time, some of whom I have since seen, and all agree. In regard to the location, it was in the Sunset Hill house on Sugar Hill, in the White Mountains, about seventeen hundred feet above the sea. The pipe which supplies water to the house comes from a spring on the mountain-side, and, passing up through the wall, leads to a reservoir on the roof of the kitchen.

The pipe on which the globular lightning was seen is a branch of this main pipe. On its way to the upper story—starting from a height of about ten feet, it comes out of the wall, and passes downward at an angle of about 30° with the vertical, ending in a brass faucet over the sink. The pipe was of wrought iron, covered inside and out with a coating of coal-tar to prevent rusting.

The phenomena described occurred during a heavy thunder-storm, and, so far as I can learn, nothing of the kind had ever happened there before, nor has it even been repeated.

N. C. WARDWELL.

Hartford, Jan. 10.

The genesis of the diamond.

In an interesting communication under this title, Prof. H. Carvill Lewis gives in No. 193 of *Science* an apparently satisfactory theory of the structure and origin of the diamond-bearing necks of South Africa and of the genesis of the gem in that region. The discovery of undecomposed peridotite as the original form of the puzzling blue ground confirms the suspicion long entertained by my friend, Prof. Henri Goraix, and myself, that very slight analogies, if any, exist between the South African and Brazilian diamond-fields, in the latter of which we have, as we think, traced the diamond to its original matrix. Communications on the subject will be found in the *American journal of science* for February and July, 1882, by myself, and in papers by Professor Goraix in the *Comptes rendus de l'académie des sciences* and *Bulletin de la Société géologique de France* of 1884.

The main points of these papers may be briefly summarized as follows. The diamond region about the city of Diamantina, in the province of Minas-Geraes (the oldest and best-known diamond-field of Brazil), consists geologically of very ancient and profoundly disturbed metamorphosed strata, which may be divided into three groups: 1°, wholly crystalline rocks, gneiss, mica-schists, etc.; 2°, less perfectly crystalline rocks, unctuous schists, quartzites (itacolunites), iron ores (itabirites), and limestones; and, 3°, quartzites. The first two groups form the nucleus of the mountainous diamond-bearing region, No. 2

greatly predominating over No. 1. No. 3, which in hand specimens (and often in the field as well) can only with difficulty be distinguished from the quartzite of group 2, with which it has up to the present been very generally confounded, lies in undulating folds over the upturned edges of Nos. 1 and 2, and at times passes to a conglomerate including fragments of both the older groups. The geological age of these groups is undetermined, but the newest of them can scarcely be younger than the Silurian, and, if not older, belongs more probably to the earlier than to the later part of that age. The eruptive rocks thus far recognized in the diamond district are granites, diabases, gabbros, and serpentinous rocks, which very probably were originally peridotites. It should be remarked, however, that the latter are apparently far less abundant than in the region farther south in the same mountain-range, in which diamonds are only found rarely, or, over large areas, not at all.

The greater part of the diamond-washing, being in river-alluviums or in gravel-deposits on the uplands, gives no clew as to which of the three groups or of the associated eruptions may have furnished the gems. A few of the upland gravel-deposits are evidently decomposed but undisturbed conglomerates belonging to group 3. The famous Grao Mogol locality described by Helmreichen, Claussen, and Heusser and Clary, where diamonds are found embedded in a hard quartzite with a conglomeritic character, belongs also, in my opinion, to this group; the diamond entering, like the other elements, as a rolled pebble. Professor Goraix, however, who has had the advantage of a personal examination of the locality, refers the diamantiferous rock to the quartzites of group 2, and admits the possibility of the genesis of the gem *in situ*, though he does not insist very strongly on this point. The difficulty I have often experienced in distinguishing the quartzites of the two groups one from the other, even when they are in juxtaposition in the same section (as I believe Professor Goraix admits them to be at Grao Mogol), leads me to the apparent presumptuousness of maintaining my opinion against that of so acute and conscientious an observer.

At a single locality, Sao Joao da Chapada, the miners have penetrated deeply the decomposed but undisturbed schists of group 2, extracting the diamond from a decomposed vein-rock from which Professor Goraix took out, with his own hands and with all possible precaution against error, several of the precious stones, after I had expressed to him the opinion that it was the veritable matrix of the diamond. Three veins of somewhat different character have been recognized. One is of quartz with plates of specular iron, to which the diamantiferous *barso* (clay) adheres. This last is an earthy mass rich in iron, which gives, on washing, an abundance of microscopic tourmaline. This last circumstance, with the abundance of iron, suggests a comparison with the peculiar auriferous veins of quartz, pyrites, and tourmaline of the vicinity of Ouro Preto in the same geological horizon, and in very similar conditions. The other veins are without quartz, and consist of a lithomarge-like clay charged with oxides of iron and manganese, which, as Professor Goraix states, bear a strong resemblance, both in composition and geological occurrence, to the topaz and euclase bearing veins of the vicinity of Ouro Preto. These veins are coincident with the

bedding, or nearly so. Besides quartz and tourmaline, they carry iron and titanium minerals (magnetite, hematite, rutile, and anatase), amorphous chloro-phosphates of some of the rarer elements (cerium, lanthanum, didymium, etc.), and, almost certainly, euclase.

The observations at this place exclude completely the idea of peridotite or other eruptive rocks. The diamond at Sao Joao da Chapada, and presumably at other Brazilian localities, is a *vein mineral*, and the conditions of its genesis (unless we admit the hypothesis of a subsequent deposition of carbon, which is uncalled for by any of the observations thus far made) must have been such as were favorable to the segregation of iron and titanium oxides, phosphates of rare elements, and certain silicates, such as tourmaline and presumably topaz and euclase. The hypothesis of a genesis through the reaction of eruptive masses on carbonaceous schists is here as inadmissible as would be that of a vein formation for the South African mines. If the origin of the carbon is to be sought in the rocks traversed by the eruptive or vein masses containing it, it is not without interest to mention that the schists of the veins in which the Sao Joao mine is excavated frequently contain graphite, though at that particular locality they are too much decomposed to enable one to determine whether it occurs there or not. It may be stated, that, in the other diamantiferous regions of Bahia, group 2 occurs either at the mines or in sufficient proximity to have furnished the diamonds. In the Bahia fields the precious stones appear to have come mainly from a conglomerate which, as it lies in the prolongation of the same range, is presumably identical with group 3 above described, and, like it, rests on a base of unctuous schists, itacolumite and itabirite. The Goyaz fields and those of Bagagen in western Minas seem to be similar to those of Diamantina, though perhaps lacking the upper quartzite. To the west of Diamantina, in the San Francisco valley, diamonds are washed from the *débris* of a conglomerate presumably of upper Silurian or Devonian age, but containing pebbles of the Diamantina rocks. In the province of Paraná the immediate origin is in a Devonian conglomerate, and this is also apparently the case with the diamantiferous placers of the province of Matto Grosso.

The Brazilian and African diamond-fields thus indicate two very distinct modes of occurrence and genesis for the gem, — one as a vein mineral accompanying oxides, silicates, and phosphates; the other as an accessory element in an eruptive rock. In the last number of the *Bulletin de la Société géologique de France*, M. Chaper presents a third mode of occurrence as the result of his observations in an Indian diamond-field. He satisfied himself that the gem occurs there, along with sapphires and rubies, in a decomposed pegmatite, having taken out two diamonds, two sapphires, and three rubies from an excavation made in that material. The circumstance that all these stones were found during the preliminary work with pick and shovel, whereas nothing was found in the washing, would, notwithstanding M. Chaper's confidence that no deception was practised, seem to the practical diamond-miner to be extremely suggestive of *salting* very inartistically done. The occurrence of remnants of a sedimentary formation of a conglomeritic character in the neighborhood of the old washing examined suggests another explanation for the occur-

rence of the gem in placers resting on a bottom of granitic rocks.

Museum nacional, Rio de Janeiro,
Dec. 16.

ORVILLE A. DERBY.

A German sentence.

Will you allow me a brief reference to a remark of one of your contributors? 'M.' quotes the following German sentence by 'one of the most distinguished German zoölogists': —

"Man darf für wahrscheinlich halten, dass die so sehr wechselnde Gestalt und Ausbildung der 'Tastborsten,' nach der Art des Thieres und den Körpergegenden, noch bestimmten Nebenzwecken zu dienen hat, ohne dass wir uns davon Rechenschaft zu geben vermögen."

In the original quotation the commas after 'Tastborsten' and before 'noch,' etc., are omitted. 'M.' quotes this as a sample of sentences which prove that German scientific writers despise the 'French qualities of grace and lucidity.'

He goes further than this. He is quite convinced that the scientific men in Germany show an 'absence of the literary sense,' though he admits there are some exceptions.

It seems to me that if 'M.' wished to furnish a proof for his assertion, he ought to have chosen a different sentence. Evidently every thing depends upon the reader for whom the sentence was intended. If the author wrote for children, his sentence was objectionable; but, if he wrote for educated persons, the sentence must be pronounced just as clear, lucid, and elegant in German as any similar sentence might be in French. 'M.' assumes to judge of the literary qualifications of people who use a language with which he himself is less familiar than he is with French and English; a language, moreover, which greatly differs in its laws of construction from French and English. Supposing he should apply his French or English standard to a similar Latin sentence by one of the recognized masters of Latin style, would the difficulty of understanding its meaning justify a person who is not perfectly at home in that language to condemn the form of the sentence?

It seems to me 'M.'s' reasoning is the reverse of 'scientific.' It looks very much like 'jumping at conclusions.' 'M.' goes further than this. He remarks on the lack of German inventiveness. But do the Germans lack inventors? They are inferior to the Americans in invention of labor-saving machinery, because they have not hitherto felt the need of it as much as Americans in their thinly peopled country.

But let us ask who invented watches, lithography, the original hand-press for printing, and the later revolving press, for the first time used in printing the London *Times*, which created a new era in newspaper printing? Who has a greater claim to the invention of the electric telegraph than Gauss of Göttingen, or Steinheil of München? Where are there more practical inventors than Krupp and the men that have made his steel-works famous all over the world? And how about Siemens (the two elder brothers), Halske, Schaefer, Budenberg, Gruson, and scores of others? Germany, so long disunited, could not afford a patent law like our own until quite recently: hence many of her inventors went to England, France, and some to this country.

There is some truth in 'M.'s' remark about the bad style of many German scientific writers, but I venture the assertion that the number of really fine

writers on science in Germany is as great as that of any other nation. I believe the following names, to which scores of others could be added, will bear out my statement: Georg Forster (the companion of Cook), A. von Humboldt, Liebig, Moleschott, Carl Vogt, Schleiden, Peschel, Helmholtz, Otto Ule (of Halle), Rossmäessler, Haeckel, Preyer, etc. Who is to be the judge as to a good German style, those who know the language as foreigners, or those who know it as natives? What would become of scientific criticism, if people may ridicule with impunity whatever differs from the standard to which they are accustomed? How does 'M.' suppose a rather long and involved English sentence, though correctly formed and considered elegant, sounds to a German who translates it literally? In a recent issue of *Science* (Jan. 7) another German sentence is quoted; and this, too, is neither a bad nor an obscure one, although it is not claimed that an advertisement—and such the sentence is—may be taken as a model of a lucid and graceful style. The number of poor writers in German is not great, in spite of all that has been written on the subject. The number of finished writers of peculiar excellence is probably as great in Germany as in France, England, or the United States.

C. A. EGGERT.

Iowa City, Io., Jan. 7.

The West Indian seal.

Since the publication of my article on this species in the last number of *Science* (ix. 35), Mr. F. W. True of the U. S. national museum has kindly called my attention to a paper on this subject by himself and Mr. F. A. Lucas, in the Smithsonian report for 1884 (part ii. pp. 331-335, plates i.-iii.), recently distributed, which I had not at that time seen. In this paper the species is positively referred to the genus *Monachus*, and the cranial characters are described and figured. The specimen forming the basis of this paper is the one presented to the U. S. national museum by Professor Poey, as stated in *Science*, iii. 752. 'This was a skin, containing the skull, of the specimen taken near Havana in 1883. The specimen is described as "a female, . . . apparently adult, though not aged." The description of the size and color, and the figures of the skull, however, show it to have been quite young, not more than two-thirds grown, and probably in its second year, the skull-sutures being still open, while in the adult, as in other seals, those of the cranium proper are wholly obliterated.

On the assumption that their specimen was adult, Messrs. True and Lucas believe that "the West Indian seal must be considerably smaller than *M. albiventer*" of the Mediterranean. The specimens obtained by Mr. Ward show that there is practically no difference in size or color between specimens of corresponding ages of the two species of subtropical seals. Many of the discrepancies in the proportions of the skull in the two forms, alluded to by True and Lucas, are clearly due, in large part at least, to the immaturity of their specimen of *M. tropicalis*. My largest male skulls even slightly exceed the measurements given by Cuvier for the Mediterranean species. I find the length of my adult male skeleton, measured along the curvature of its axis, to be seven and a half feet; measured in a straight line, seven and one-tenth feet, or 85 inches. The length of the stuffed skin of the Havana specimen, as given by True and Lucas,

is only 53 inches. In view, however, of the widely separated habitats of the two forms, there is every probability of their specific distinctness, and adequate material doubtless would reveal numerous minor structural differences.

As compared with other species of the family Phocidae, the skeleton of *M. tropicalis* presents notable peculiarities, particularly in the form of the scapula, the pelvis, the proportions of the limb-bones, etc., as well as in the low position of the mandibular condyle, referred to by True and Lucas. The scapula, for example, is remarkably short and broad, the length to the breadth being as 16 to 28, both the anterior and posterior borders being greatly developed. The acromion process is well marked; but the spine is low and short, forming little more than a well-marked ridge, in comparison with its usual development in other phocids. The pelvis is remarkably short and broad: the thyroid foramina are fully half as broad as long. The femur is very short and thick, not longer than in *Phoca vitulina*, notwithstanding the much greater size of the animal, the same being true likewise of the pelvis. Throughout the skeleton the proportion of parts is rather exceptional, the fore-limbs being much more developed, relatively to the hind-limbs, than in the seals generally. As I stated in 1870 (*Bull. mus. comp. zool.*, ii. No. 1, p. 30), *Monachus* much more nearly approaches the Otariidae than does any other genus of the Phocidae, through its skeletal proportions and peculiarities. The animal is in form very robust. The bones are thick and heavy, with the apophyses of the vertebrae strongly developed. Further details, however, must await the appearance of my illustrated memoir on this species, now in preparation for early publication in the Bulletin of the American museum of natural history.

To Messrs. True and Lucas is due the credit of first making known, in their paper above cited, the cranial characters of the West Indian seal, and of confirming its reference to the genus *Monachus*; and I much regret not having seen their valuable contribution when I penned my former notice of the species. While the 'Report' containing their paper bears date '1885,' it appears not to have been generally distributed till some time in December, 1886.

J. A. ALLEN.

New York, Jan. 14.

On hybrid dogs.

If my memory serves me correctly, I think it was Dr. Coues who pointed out the fact somewhere, in one of his works, that he had personally known of cases of fertile crosses having taken place between the coyoté (*Canis latrans*) and that species of semi-domesticated dog found with nearly all the Indian tribes of this country. His instances were cited, however, I believe, for the Sioux camps of the Indian agencies of certain parts of Dakota.

Now, a year ago there came under my observation here an interesting case of this kind, the occurrence having taken place at Zúñi, in south-western New Mexico. Zúñian Indians have many varieties of wolfish-looking dogs at their pueblo, while coyotés are always found prowling about on the surrounding prairies. Such circumstances as these, granting that these animals will cross, are as favorable as any we could imagine; for the pueblo, with the ends of its streets leading in the majority of instances directly out upon the prairie, affords the opportunity, not

only for the dogs to run out upon it at night, but the coyotés, long since accustomed to the sight of the pueblo and all that is in it, to approach with less suspicion than they would even about an Indian camp. Moreover, some of these Zúñian dogs have very much the appearance and behavior of the coyotés themselves, and quite as much cunning in some instances. Among the rarer varieties of the former we sometimes find a sheep-dog of apparently the same breed of animal often seen in certain parts of the eastern states. I refer to the black-and-tan variety, with the shaggy coat, and the tan-spots, one over each eye. The trader at Zúñi, an observing and intelligent Englishman, has long owned one of this latter kind, — a bitch of excellent qualities, — and it is from this gentleman that I came into possession of the following account. He tells me that a little over three and a half years ago, the opportunity was afforded him to become personally cognizant of the fact that this shepherd-dog bitch of his was lined by a large male coyoté one evening just beyond the limits of the pueblo. In due time she gave birth to four male pups, that looked curiously like young coyotés from the hour they were born. When I came to Wingate here, all four of these dogs were fully grown, and were owned by different parties at the garrison, and I had excellent opportunities to study them. They all very much resembled each other, and the entire progeny are the very exemplification of what we might easily imagine the offspring of such a parentage would be. Taking any one of them as an example, it is to be noted that the animal has a form somewhat heavier than a coyoté, and yet more slender and agile than a shepherd-dog. As we would naturally expect, its pelage is rather long and shaggy, with a handsome flag to its tail. In color it is a fine stone gray, inclining to blackish on the flanks and sides; the spots are absent from over the eyes. The ears have more of the form of the coyoté's than they have of the ears of the mother; while the fore part of the face, and the muzzle, more nearly approach that of a shepherd-dog. One of the most interesting features of it all is to hear one of them bark; for those who may be familiar with the despicable howl of the prairie-wolf can here have the opportunity to fully appreciate how much that kind of music can be improved by being semi-modified by such crossing in stock. The yelp becomes softened, and the more intelligent expressions of the bark are introduced, though in the present case these seem to be about equally divided in the voices of these hybrids.

When out of the garrison, I have observed much in their behavior that reminds me of the coyoté, more than it does of the dog. They run and trot like a coyoté; and when off at a distance they have a way of standing sidewise as motionless as a statue, and regarding you; while at such times they keep their two fore-limbs together, as well as the hinder ones. Such a position is very commonly assumed by the prairie-wolf, and may be said to be a direct lateral view of the animal, with its face looking towards you.

Space will not permit me to enter upon the many little interesting traits of these animals, which plainly are due to the crossing of the parent stock, and have been inherited by the issue.

It is my present aim to purchase one of these animals, if possible, with the view of securing its

skeleton, more especially its skull. This latter would undoubtedly make an interesting thing to compare with Huxley's valuable work on the skulls of the Canidae. I have collected a fine series of the skulls of the coyotés, and have them in my possession at the present writing.

R. W. SHUFELDT.

Fort Wingate, N. Mex., Jan. 11.

To authors of text-books on physics.

The definition of the coefficient of elasticity, given by Professor Baker on p. 34 of the current volume, is vitally defective because the unit of section is omitted. It reads, "The coefficient of elasticity may be defined as the force which would double the length of a bar." According to this, if the section of one bar were twice that of another, all other things being equal, the coefficient of elasticity of the former would be double that of the latter, which is not true. A student might further object that solids cannot be elongated to double their length, nor liquids be compressed to half their volume, or, if they could, the coefficient would not remain constant during the operation. Strictly speaking, the coefficient of elasticity is a *rate*, and may be defined as the rate of change of the stress per unit of section to that of the elongation per unit of length. This is true for the incipient elongation due to an incipient stress. If it be *assumed* that the section of the bar remains uniform and the elasticity remains perfect during the elongation, then it will be true that the coefficient of elasticity equals the force which would double the length of a bar whose cross-section is unity.

DEVOLSON WOOD.

Hoboken, N.J., Jan. 15.

H. Allyne Nicholson.

In answer to a letter of condolence written in consequence of the press despatches announcing the death of Prof. H. Allyne Nicholson, Dr. C. A. White has received a letter from Professor Nicholson himself, saying that he is not dead, but alive and well.

If the above has not been announced, it may be of interest to the readers of *Science*.

EDW. J. NOLAN.

Philadelphia, Jan. 17.

Abbott's Greek reader.

I like the freshness and independence of your critical comments. But you object to the publishers of Abbott's 'Greek reader' binding the notes separately from the text. 'Much' may be 'lost in convenience,' as you say, but some of the best instructors in the classics object to notes in the classroom, in the hands of the student. They are entirely too convenient, a great hinderance to the best mental discipline, and a temptation to neglect thorough preparation beforehand.

E. T. JEFFERS.

Lincoln Univ., Chester co., Penn.,
Dec. 29.

Advertising for professors.

Science and education for Dec. 24, on p. 65, speaks of advertising for professors.

The University of Mississippi recently advertised. There were five vacancies and five hundred and twenty-seven applications!

M. W. EASTON.

SCIENCE.—SUPPLEMENT.

FRIDAY, JANUARY 21, 1887.

THE UNIVERSITY EXTENSION MOVEMENT AT CAMBRIDGE.

THE university extension movement was begun at Cambridge about fifteen years ago. It occurred to some energetic men, especially to Professors Stuart and Sidgwick, that the university should attempt to influence the education of the country not only by examinations, but by direct teaching. It was thought that young men were sent out every year by *alma mater* for whom there was no place in the teaching system of the university itself, but who might find a field of activity in the great towns of England. The system has grown up from very small beginnings. At first a private enterprise, it shortly became part of the university organization, and it is now a recognized department of university work. During the last six years the growth has been very marked. In 1880 there were thirteen centres, in 1885 there were thirty-six. In 1880 thirty-seven courses of lectures were delivered; in 1885, eighty courses. The attendance at lectures, which in 1880 was 4,300, rose in 1885 to 8,500. The movement has spread all over England. The miners of Northumberland form a numerous and intelligent audience. There is a centre at Torquay and a centre at Portsmouth, but, as might be expected in England, the northern centres far outnumber the southern. London is the seat of a separate management under the joint government of the two universities, which extends its ramifications into the suburbs. Hitherto the teaching has been scattered over the country without any definite order or arrangement. Each centre has chosen that subject which seemed to suit it best. There have been examinations with classes and marks of distinction, and a certificate has been given by the vice-chancellor of the university, but there has been no systematic and continuous arrangement of teaching analogous to that which exists in the university itself. This want will now be supplied. The university has determined that attendance at certain courses of lectures, tested by examinations and marked by a certificate, shall take the place of a certain amount of residence at the university. When this scheme is put into working order, we shall have a system of academic teaching extending over the whole country,

and directly connected with university degrees. No more efficient means can be found of connecting the old English universities, which have too often been considered as hot-beds of clericalism and toryism, with the growing life of the nation, especially in the most democratic districts.

Let us now see how the system practically works. A town wishes to establish a course of extension lectures. The first business is to elect a committee, and to raise the necessary funds. The session extends from September to April, and occupies two courses of three months each, either of which may be taken separately. The lecturer is paid forty-five pounds for twelve weeks, the last week in each term being devoted to examinations. When it is found that funds can be provided either by subscriptions or by the sale of tickets, communications are opened with Cambridge. If the town is situated in the neighborhood of other towns which have previously established courses, matters can be arranged on a more economical basis. The university informs the town what lecturers it has at its disposal, and what courses they are able to give: the town determines what kind of lectures it desires to receive. The subjects vary very much. The northern miners are keen for instruction in science: suburban ladies prefer the literature and art of mediæval Italy or Germany. The lecturer belongs to one of two classes: he is either a man who has taken up this occupation as a profession, whose reputation is well known, and who occupies a position not inferior to that of a recognized university teacher, or he may be a young man who has just taken his degree, a senior wrangler, a senior classic, or a senior historian, who looks upon the occupation of university extension lecturing as one of the best openings available for an ambitious and successful career.

The first duty of a lecturer is to prepare his syllabus. It was laid down at the commencement of the scheme that every lecturer must, before he begins his work, write an elaborate syllabus, partly as a guaranty that his lectures are really good and thorough, but chiefly as an aid to his class in threading a difficult and unfamiliar subject. Two of these syllabuses lie before me, both by lecturers beginning their work. The first course, by a senior wrangler, is on work and energy: it consists of twelve lectures. The first, being introductory, is on the study of natural science, on its results, its methods, and the various

manners of discovering scientific truths. The second lecture is on the laws of motion, including a popular exposition of Newton's three laws. The third lecture is devoted to the examination of work, energy, and gravitation. In the fourth lecture certain simple machines are described, — the pendulum, the different kinds of lever, and the water-wheel. The next lecture deals with the nature of heat, and the sixth with the more elaborate theories of Mayer and Joule. The seventh lecture deals with light and sound, the eighth with chemical energy, the ninth and tenth with electricity and magnetism. The eleventh lecture is devoted to the conservation of energy and the manner in which it is transformed from one shape into another. The last lecture treats of the dispersion of energy, and concludes with an account of the sun.

It may be thought that this course is somewhat too extensive and ambitious, and its practical success remains to be proved by the examination; but no one can deny that it forms a brilliant attempt to deal in a single view with the main truths of physics.

The second course is of an entirely different character: it treats of the origin and early history of the English colonies in North America. Like the former, it consists of twelve lectures. The first lecture is devoted to ancient and modern systems of colonization, the Greek, the Roman, and the systems of modern states. The second lecture treats of the early voyages and settlements in America from Christopher Columbus down to the foundation of Quebec. Then follows the colonization and early history of Virginia, the colonization of New England, of Maryland, of the two Carolinas and Georgia; next come the Quaker colonies of New Jersey, Pennsylvania, and Delaware. In the eighth lecture we have reached the subject of the early colonial wars of France and England, from King William's war in 1689-97 down to the conspiracy of Pontiac in 1763. The condition of America in 1763 is then dealt with, with a sketch of each colony from the beginning of the eighteenth century up to that time. The tenth lecture treats of the war of independence; the eleventh, of the American constitution; and the twelfth and last, of the history of modern Canada down to the present day.

These syllabuses are printed in little pamphlets, and the chief criticism to be made upon them is that they are often somewhat too long and elaborate. Where so much is printed for a course, there is less room for detailed exposition. This, however, is a fault on the right side, which experience will prevent.

The lectures are given once a week, and last

an hour. The hour which precedes or follows the lecture is taken up with what is known as 'the class.' In this the formal method of the lecture is abandoned, discussion of difficult points is invited, questions are put to the lecturer on any thing that appears obscure, or the lecturer gives additional details and illustrations. The class is open to all who attend the lectures, but in a series of years this is generally found not to exceed one-half. At the end of each lecture in the syllabus will be found three or four questions which are to be answered by the students at home; and help is freely given in the little pamphlet, as to the line to be taken in answering the questions, and the books to be used. These exercises are purely voluntary: the answers are sent to the lecturer, who returns them with corrections before the following lecture. The number of those doing papers is not more than one-third of those who attend the class, or one-sixth of those who attend the lectures. Finally, at the end of each term, an examination is held, conducted, not by the lecturer, but by independent examiners appointed by the university. The numbers examined form about one-fourth of the class, or one-eighth of the whole attendance at lectures. In connection with each course of three months, certificates are granted on the double basis of the lecturer's report of the weekly exercises and the examiner's report of the final examination. In this way is tested not only the capacity of getting up a subject and passing an examination, but the continuous effort of steady work throughout the term. It is very interesting to consider what classes of people are reached by the university extension lectures. Although the movement was first devised for adults, yet the lectures have been generally frequented by schools, and especially by girls' schools. They are useful in cases where a competent visiting lecturer cannot be obtained. Much more accessible to these influences are young people who have left school, and have not yet settled in life. This is the golden age for education, corresponding to the time spent at college by those who can afford it. From these classes, if from any, must be drawn the affiliated students whom the extension movement will link with the university. If the lectures are delivered at night, they are usually attended by clerks and shop people, who are at work in the day.

However, the most interesting field of work which the movement has yet found has been the artisans, and among these are pre-eminent the miners of Northumberland. Mr. Roberts, the organizing secretary, writes, after a fortnight's visitation to Northumberland, "I wish I could adequately describe the impression this fortnight's

work made upon me. The sturdy intelligence of the pitmen, their determined earnestness, the appreciative and responsive way in which they listened, the downright straightforwardness of their speech, — all these it is impossible fully to express. I am persuaded that in the Northumberland and Durham districts the pitmen are ripe for a scheme that will bring higher education and culture within their reach." The northern population is eager for knowledge, and travels long distances to seek it, in all kinds of weather, over the roughest of roads. Some persons here walked regularly six miles to hear the lectures. At Newcastle some travelled as much as ten miles to hear the lectures. Two pitmen, brothers, attended a course regularly from a distance of five miles: they went there by train, but were compelled to walk home. This they did for three months on dark nights, over wretchedly bad roads, and in all kinds of weather. One miner writes in gratitude, "I deeply deplore the last thirty-four years of my life. Being buried in the mines since I was nine years of age, and taught to look jealously on science as being antagonistic to religion, I little thought what pleasures of thought and contemplation I lost; I have, however, broken loose from my fetters, and am proceeding onwards." It is sad to think that this energy and hunger for learning should be cramped by inability to pay for it. Working-men can seldom afford more than one shilling or one shilling sixpence for a course, yet at two shillings a ticket it would take an attendance of seven hundred to make the lectures pay. Besides, the cost of the ticket is not the only tax on the artisan. Text-books must be bought, weekly papers posted to the lecturer, while wages are lost by attendance at the evening classes. The whole system requires a solid pecuniary basis to make it permanent; and that, up to the present moment, has not been forthcoming.

Although much has been done, we may hope for much larger developments in the future. A staff of thoroughly trained lecturers should grow up, who will make this occupation the work of their lives. The courses of instruction will be more systematic, and will be spread regularly over a number of years. In some cases the lectures will crystallize, as they have already done, into local colleges or small universities; in others they will remain in a more fluid state. Whatever may be the result of the movement, there is no doubt that the problem has been solved of bringing the highest university education within the reach of the lowest classes who are capable of receiving it. Such a movement may be less necessary in countries where education is more democratic, and where no class has been left out; but in England,

where the higher education, like every thing else, is organized mainly for the privileged classes, such an enterprise is an incalculable boon.

Some few years ago, on a summer afternoon, a body of artisans were watching our Cambridge undergraduates amusing themselves on the river which flows by the backs of the colleges. Their conversation was overheard by a passer-by, and it was discovered that they were under the impression that all Cambridge undergraduates were sons of noblemen, and that no one could live at the university under a thousand pounds a year. This was the exaggeration of ignorance, but let us hope that the extension movement will in another generation render all such misunderstandings impossible.

OSCAR BROWNING.

THE TRAINING OF THE FACULTIES OF JUDGMENT AND REASONING.¹

I AM going to endeavor to show, as far as I have the power to do so, how the psychological and logical principles which relate to judgment and reasoning may be applied to the treatment of our ordinary school subjects, — what our methods of teaching should be, if we desire those methods to be framed in accordance with the laws and suggestions of mental science. I must refer you to Mr. Sully's indispensable 'Teacher's handbook of psychology,' for the discussion and full exposition of the psychological principles. But also, I shall begin by running over the chief points which require our attention, before I attempt to sketch my lessons, so that you may have the principles on which I work freshly in your minds. My desire, as you know, is not to upset or change this or that method of teaching this or that subject, but to bring the precepts and laws of psychology to bear directly on the actual practice of the classroom. In what I have got to say on the logical side of the matter, I am largely indebted to Mr. Jevons, to whose excellent and suggestive little book, 'Elementary lessons in logic,' I must refer you. And let me say here that I think every teacher ought to own the book, and to make a point of mastering especially the last ten lessons.

To judge is to connect two notions, two representations or mental images of what has been perceived; and the outward expression of this act is a statement in words, or a proposition. Thus, if we have acquired the general notions or concepts, say, of hardness and heaviness, we may connect either or both with any particular thing or class of things, or with any other notion. We may say, 'This ground is hard,' or, 'This table is

¹ From the *Journal of education*, a paper read before the Education society, Oct. 25, 1886.

heavy,' or, connecting two concepts, 'It is wise to be merry.' It does not matter how we have acquired the information, or by what mental process we have reached the assertion: we may say, using direct observation, 'This boy is tall,' or, making an inference, 'There will soon be another general election;' in either case we have given expression to a judgment. Of course, if we merely echo somebody else's statements, we give expression to his judgments, but we do not perform acts of judgment of our own, — a fact which young and old, in and out of school, are always forgetting. The work of connecting the two notions or mental images must be our own before we can be considered to have performed an act of judgment. The connection may be wrong or unwarrantable, but the formation of it will none the less constitute what we here define as judging; that is, if it be made with a certain amount of belief in the reality of the connection. If there be no such belief, we shall not consider the statement as the expression of a judgment. Our statements may either be affirmative or negative; about individuals or about classes, i.e., what are called 'singular' or 'universal' judgments, as, for example, 'This boy loves exercise,' 'Boys are fond of action.' In the case of negative judgments, we may suppose some one to have originally asserted a connection between two notions; and the mind has then to decide whether the assertion be true or not true (untrue). If it decides in the latter sense, the judgment will be a denial, not an affirmation, of the connection between the notions. We may, however, sometimes turn the judgment into the affirmative form, as thus: if we deny that 'this bag is heavy,' we say, 'This bag is not heavy,' i.e., 'This bag is light.' But this is assuming that there is no alternative to 'heavy' but 'light,' while we may easily conceive of a state which could not be described either as the one or the other. If there be several alternatives, still more must the statement remain negative. I cannot transpose, without changing the subject of which I speak, such a statement as 'This leaf is not green.' This is, however, rather a matter of logic than of psychology.

There is another point on which it will be of more importance to touch, — the relation of conception to judgment. We have seen that in the former there is a process of combining. The concept 'metal' is formed by mentally grouping together a certain number of qualities or properties, grouping them so as to make one complex mental image or representation. As Mr. Sully says, "The mind here comprehends the several qualities as together comprising one thing or substance. In judgment, on the other hand, we dis-

tinctly set forth two representations as two, keeping them apart from one another, while at the same time we connect them with one another. We think of certain objects or qualities as distinct, and at the same time explicitly view them as related." Thus, in affirming that 'iron is a metal,' we think of the quality of being a metal as something apart from the iron, something new which we assert to belong to it. In fact, we have here the same distinction as we have in grammar between the name with the attributes of the subject, and the predicate. To express a judgment, we must make use of a predicate, or give some new information about that of which we are speaking: in the case of a concept, we have merely the general notion, simple or complex, corresponding to the name and its attendant describing adjectives, or to the name alone. We must bear in mind, however, that many, if not all, concepts are formed by a succession of judgments. Every addition to our knowledge of the properties or qualities which correspond to a general term takes the form of a judgment. The very bringing of things together on the ground of their likeness, or the separating of them because of their dissimilarity, is a judgment; while, in its turn, the fuller concept becomes an element in our later and more precise judgments.

Like every thing else, our judgment will have various degrees of perfection and imperfection. The most important quality of a judgment is clearness; the next, accuracy; while promptness, stability, and independence are all of considerable value. By a clear judgment we mean one in which the concepts or representations are distinct, and the relations between them distinctly understood. The judgment, 'Poetry is a criticism of life,' will be just so clear, and no more, as the concepts 'poetry,' 'criticism,' and 'life' are distinct, and as the mind clearly discerns the relation between 'poetry' and 'criticism of life' which is implied in the assertion, — how it is equivalent to certain verbally unlike statements, but incompatible with others. It is easy to see that want of proper observation is one of the commonest sources of indefiniteness. If the observation has been faulty, the concepts or representations will be faulty, and so will be our apprehension of the relation of the notions we wish to connect. Memory may play us false by recalling imperfect images, or by recalling them with all the life and reality of the relations between them departed; or feeling may come in, paralyzing our powers of discrimination, and misdirecting our decisions. We must not omit to note, moreover, the tendency that most of us have, and which is particularly strong in children, to accept the judg-

ments of others, though we do not apprehend or realize the meaning of what is asserted, and are somewhat hazy as to what the assertion concerns. We teachers are very liable to produce vagueness and confusion in this way. We impose our judgments on our pupils; we are contented with their ready assurance that 'they see;' we rush on from step to step, and then are astonished to find how hazy and muddled the children's views are. Teachers have even been known to grow quite impatient with the children on this account, resenting delay, and setting all the confusion down to a wilful perversity on the child's own part. The other qualities which characterize sound and serviceable judgments need no particular remark here.

Many of our judgments are arrived at immediately or intuitively, such as, 'This fire is warm,' 'I saw my friend last week.' These are called 'intuitive' judgments. But, on the other hand, it is plain that many of our assertions are reached by a process of reasoning or inference. Just as we connect two concepts or representations to form a judgment, so we may connect two or more judgments to form another judgment in advance of these. Thus, from the assertions that 'all metals are elements' and 'iron is a metal,' we may derive the judgment that 'iron is an element;' or we may infer that 'all material bodies have weight,' because we have found that this and many other material bodies have weight. The resulting judgment we term a 'conclusion,' and the judgments from which it is derived 'premises.' To reason, then, is to pass from a certain judgment or judgments to a new one. This implies that we recognize the relation between the new and the old judgments; that we apprehend the connecting link or similarity between them. Reasoning is, in fact, as Mr. Sully observes, "only a higher and more complex process of assimilation, identification, or classing." From mere difference we can infer nothing. If x and y are both equal to z , we can infer that $x = y$; but if x and y are both greater or less than z , we cannot from these facts infer any thing as to the relation between x and y . Again: in our reasoning the premises and the conclusion may both be particular. A boy may have noticed that on several occasions when the wind was in the east his master was cross, and he may infer, that, the wind being in the east to-day, his master will be cross. Or the premises may both, or one of them, be general, and the conclusion be either general or particular; as when we reason, that oxygen being a material body, and all material bodies having weight, therefore oxygen must have weight; or that all gases have weight,

because all gases are material bodies. The former is called implicit, the latter explicit, reasoning. But the distinction is not of great value to the logician, because we do, as a matter of fact, in implicit reasoning, tacitly assume a general premise: the boy in our example, consciously or unconsciously, assumes that *all* east winds make his master cross. There is another distinction, however, which applies to reasoning, and which will be of great use to us. We may either argue up to a general truth from premises which are particular, or at least less general; or we may apply this general truth to cases which are less general or particular. Thus, having found that gold and silver and copper, etc., are all elements, we may arrive at the conclusion that all metals are elements; or, seeing that all birds die, and all fishes die, etc., we may infer that all animals die. On the other hand, from the general truth that all the radii of a circle are equal, we may infer that two particular straight lines, AB and AC, being the radii of the same circle, are equal to one another. In the former case, our reasoning is said to be inductive; in the latter, deductive.

The chief point to notice in induction is, that in general our conclusion goes beyond what our premises give us the right of asserting as actually true. We can never, therefore, be certain, in such cases, of arriving at absolute truth, but only at a greater or less degree of probability. When we assert that all planets move round the sun in the same direction, the 'all' includes more cases than are mentioned in the premises, — more cases than we have observed. Further experience may prove that some of our general conclusions are wrong. This has been the case with the emission theory of light, which has now been abandoned for the wave theory. Or, to quote a simpler case, Mr. Jevons mentions that Format maintained that $1 + 2^{\frac{x}{2}}$ always represents a prime number for all values of x ; and so it does, till the product reaches the large number 4,294,967,297, which is divisible by 641. This danger should be a warning to us in our use of inductive reasoning with children at school. We are all of us, young and old, far too much given to generalizing¹ from too few particulars, and to asserting that what has happened in a certain number of particular cases

¹ It will be well to note, in order to avoid confusion, how inductive reasoning, which is a kind of generalization, differs from the generalization of judgment. In each case we trace out a similarity among a number of different things. In judgment, we do so in things viewed as single and apart, in order to connect with one or all of them a general notion applicable to them all: in induction, it is the *relations* of things to one another to which we attend, and we seek to establish some connection between these relations, and thus to arrive at some wider relations between the things themselves.

will always happen in all like cases. This is a habit, or a tendency, not to be encouraged, but to be corrected. The experience of children can never be very great, — never sufficient for a very wide generalization; and to allow them to draw conclusions from insufficient experience, however right our wider experience may have shown that conclusion to be, is to allow them to form a very bad habit indeed. Are we, then, to exclude inductive reasoning from the schoolroom? By no means. Inductions vary almost infinitely in their degrees of generalization, from the narrow inductions with which children themselves spontaneously begin, such as ‘Flies die,’ to the law of gravitation. Let us follow nature’s hint, and restrict our pupils’ work at first to the narrower kinds. We shall then be fairly safe, especially if we are careful, as we should be, to afford the young inquirer every possible opportunity of testing and correcting his conclusions. I need scarcely point out here that the inductions of mathematics will be at first even more useful to us than those of physical science. In mathematics the premises are so carefully restricted, and the applications of the conclusions so strictly narrowed, that within their assigned bounds our inductions are absolutely true; so much so, that Mill refused to regard them as real inductions at all. Moreover, we can test them exhaustively, — I will not say *exhaustingly*, — and so make perfectly clear their truth and value. In grammar also, especially in that of the mother-tongue, the inductions are simple and easily made, and the means for testing their accuracy are always ready to hand. Again, the way in which children earliest show their curiosity is in seeking for causes. They have a strong tendency to look upon every thing as having a cause and a purpose. Here, then, is another valuable hint of nature as to the kind of work we should choose. Many easy exercises of the kind we require are to be obtained from among the simpler phenomena of nature, or from mathematics, and even history. The discovery of causes is, however, often a very difficult process, and always implies a method of procedure. For a discussion and exposition of this, I must refer you to two excellent chapters in Mr. Jevons’s little book (chapters xxviii. and xxix). For convenience sake, I shall quote here Mill’s canons which bear on this matter, and which are to be found in the chapters referred to. The first is the rule for the method of agreement: “If two or more instances of the phenomenon under investigation have only one circumstance in common, the circumstance in which alone all the instances agree is the cause (or effect) of the given phenomenon;” or, more briefly, the sole

invariable antecedent of a phenomenon is probably its cause. The next refers to the method of difference. It runs: “If an instance in which the phenomenon under investigation occurs, and an instance in which it does not occur, have every circumstance in common save one, that one occurring only in the former, the circumstance in which alone the two instances differ is the effect or the cause, or an indispensable part of the cause, of the phenomenon.”¹ As Mr. Jevons remarks, this is essentially the great method of experiment, and its utility mainly depends upon the precaution of only varying one circumstance at a time, all other circumstances being maintained just as they were. Thomson and Tait remark (*Natural philosophy*, vol. i. p. 307), “In all cases when a particular agent or cause is to be studied, experiments should be arranged in such a way as to lead, if possible, to results depending on it alone; or, if this cannot be done, they should be arranged in such a way as to increase the effects due to the cause to be studied till these so far exceed the unavoidable concomitants that the latter may be considered as only disturbing, not essentially modifying, the effects of the principal agent.” The next canon refers to a joint method of agreement and difference: “If two or more instances in which the phenomenon occurs have only one circumstance in common, while two or more instances in which it does not occur have nothing in common save the absence of that circumstance, the circumstance in which alone the two sets of instances (always or invariably) differ is the effect, or the cause, or an indispensable part of the cause, of the phenomenon.” The next canon relates to what may be called the method of concomitant variations: “Whatever phenomenon varies in any manner, whenever another phenomenon varies in some particular manner, is either a cause or an effect of that phenomenon, or is connected with it through some fact of causation.” Lastly, I will quote the canon relating to what Mill called the method of residues: “Subduct from any phenomenon such part as is known by previous inductions to be the effect of certain antecedents, and the residue of the phenomenon is the effect of the remaining antecedents.” Those who desire more than Mr. Jevons gives, may find it in Mill’s ‘System of logic’ (book iii. chapters 8, 9, 10).

¹ So, when we are trying experiments on condensation, — of steam, for instance, — we find that a plate held in the steam condenses some of it. What causes this? Perhaps the coldness of the plate’s surface. Well, then, let us heat the plate and try: result, no condensation. Let us make the plate very cold by placing it for a little while in the freezing mixture. What is the result now? Increased condensation. Probably, then, cold produces condensation. And so on, through a number of other experiments.

By the processes I have described above, the child reaches a large number of general or universal judgments. To these are added all the general statements made to him by others in the course of instruction. These he can now apply to the explanation of particular or less general cases, as has been already shown; that is, he can make use of deduction. The logical forms of this kind of reasoning are: "All soldiers have to fight; John is a soldier, therefore John has to fight;" or, "No mistakes deserve praise; this is a mistake, therefore this does not deserve praise." But though this is the logical, it is seldom if ever the psychological order of inference. As Mr. Sully points out, "in some cases the conclusion first presents itself to the mind, and the other judgments rise into distinct consciousness later; and in other cases the mind does not at any stage distinctly represent more than one of the two truths making up the premises." Again: besides starting with a general truth and seeking to make applications of it, we may also start with some particular statement or fact, and then seek among the general truths already acquired for that under which it may be brought. In our language work we may have an instance of a noun in the genitive, and we seek to find what rule for the genitive will explain our instance. Or in our geometry work we may have a theorem given us to prove: we assume it to be true, and then seek to attach it to some known and already proved theorem, and then, finally, reverse our work to produce the proof required. This last is the usual way in which children explain things to themselves and others. "Why am I blamed for having done this? Because what I did was called, or was, cruel, and acts called cruel deserve blame," is the clear statement of the reasoning which, more or less confusedly, will pass through the mind of a child. In connection with this, we should note the method by which all our greatest discoveries concerning the laws of nature have been made. The examination of a certain number of particular cases suggests a general principle (or more than one) under which they may be brought. We assume the general principle to be true, and deduce the results for several particular instances. We then compare these results with the results of actual observation in the same cases. If the latter confirm the former, we accept the general principle as true — at any rate, for the time being; if they do not, we either modify our assumption or try another. It was in this way that Newton and Faraday, and numberless others, worked, and that all men of science are now working. It was in this way that the great theory of the conservation of energy

was discovered, and which was verified so admirably by Mr. Joule's experiments. In this, as in nearly all our complex reasoning, you will observe that induction and deduction are mixed; the former suggesting general truths, and the latter deriving conclusions from them. Both these two kinds of reasoning are liable, of course, to error. Both depend on observation, reproduction, imagination; both are processes based on the detection of similarity. If these are faulty, our conclusions will be fallacies. Especially in the case of deduction is a mistaken idea of similarity, or the want of discrimination, a fruitful source of error; the ambiguity, or want of clearness, in the terms employed being also most frequently a great cause of our going astray. Attention as regards all that is employed in our argument, and concentration as regards the special object of our search, will also be necessary parts of our outfit.

As Mr. Sully has pointed out, the powers of judging and reasoning show themselves later than the power of conception. At quite an early age, children will form rudimentary notions of things, and will even go as far as the formation of implicit judgments; but they will not yet be able to form explicit judgments. The order of development appears to be as follows: 1°. Implicit judgments, — the results of observation and memory, involving no inference; 2°. Explicit judgments, involving inference, about individual things, consisting of statements about actual facts then present; 3°. Judgments concerning striking attributes, later with reasons; 4°. Judgments involving consciousness of alternatives, introducing 'no' and 'not'; 5°. Judgments concerning classes, the predicates becoming gradually more general and more abstract; 6°. The curbing of exaggerations and mis-statements, — less tendency to treat fancies as realities, — criticism of the statements of others, or increase of independence. The development of reasoning follows very similar stages: 1°. Reasoning from particulars to particulars; 2°. Then seeking for causes, with the familiar 'why'; 3°. Deductive reasoning, consisting of the application of simple rules to simple particular cases, then to cases requiring a more intimate understanding of the rule, then the application of rules less simple; 4°. Somewhat later will come inductive reasoning, with ever-increasing power of abstraction; 5°. Lastly, complex reasoning and chains of demonstration.

For convenience, let me recapitulate the points on which clear judgment and clear reasoning depend. Clear judgments depend on clear conceptions and representations, and on the clear understanding of the connection stated and the terms

employed, and also on keeping the emotions under due control. Judgments should be clear, accurate, prompt, stable, independent. Clear and sound reasoning depends on clear and sound judgments; on the clear understanding of the relations between judgments and the terms employed; and on clear attention and imagination (involving discrimination), which keep vividly present the relations of the ideas and the objects with which we are concerned. Fallacies arise mainly from mistaken ideas of identity or similarity.

Here I should like to quote the whole of Mr. Sully's section on the training of the powers of judgment and reasoning, the subject is so difficult, and what he says is so clear and sound. Children, as we know, delight in exaggeration: nothing is so attractive to them as vividness and picturesqueness of statement. Their fancies are active. Their curiosity, except as to what directly helps fancy, is fluctuating and easily satisfied. The anthropomorphic nature of many of their views about nature is startling to those who have forgotten their own childhood. To step in, and seek to repress and change and destroy all this, is to act in distinct opposition to the teaching of nature, — a proceeding which some teachers* already recognize as ill-advised and unsafe. Surely a teacher who would destroy a child's delight in fairyland, or its happy belief that its pet dog understood every thing said to it, and the like unjustifiable ideas, would deserve a punishment but little less than that of old inflicted on traitors. Again: unless the child himself forms the judgments and does the reasoning, there is no exercise of his faculties, and therefore no development. But his experience is very small, and his conclusions can seldom be justifiable, even when correct. It cannot be right to encourage him to generalize from insufficient data, and to reason without clear discrimination. In the face of these difficulties, I should advise that we be not in too great a hurry to give a systematic training to the reasoning faculty. The eleventh or twelfth year would be quite early enough, I think, to begin. Meanwhile there is much work to be done in exercising the senses, attention, memory, imagination, and conception; while the exercise of judgment, which the later stages of this work will introduce, will be quite enough, at first, for our needs. By all means, let us encourage the child's curiosity by affording him the means of feeding and satisfying it. If rightly treated, it will grow by what it feeds upon. When the child cannot, of himself, attain to the knowledge requisite, let us, using a wise discretion, give him an explanation such as he can understand. In this way we shall not interfere with his fancies, though they, in some cases, when

too vagrant and emotional, must be gently checked. Difference in the temperament of children should make a difference in their treatment. "But" — and here Mr. Sully speaks — "the training of the reasoning powers includes more than the answering of the spontaneous questionings of children. The learners must be questioned, in their turn, as to the causes of what happens about them. A child cannot be too soon familiarized with the truth that every thing has its cause and its explanation. The mother, or teacher, should aim at fixing a habit of inquiry in the young mind, by repeatedly directing his attention to occurrences, and encouraging him to find out how they take place. He must be induced to go back to his past experiences, to search for analogies, in order to explain the new event. The systematic training of the reasoning-powers must aim at avoiding the errors incident to the processes of induction and deduction. Thus, children must be warned against hasty induction, against taking a mere accidental accompaniment for a condition or cause, against overlooking this plurality of causes. This systematic guidance of the child's inductive processes will be much better carried on by one who has studied the rules of inductive logic. In like manner the teacher should seek to direct the young reasoner in drawing conclusions from principles, by pointing out to him the limits of a rule, by helping him to distinguish between cases that do, and those that do not, fall under it, and by familiarizing him with the dangers that lurk in ambiguous language; and here some of the rules of deductive logic will be found useful." Finally, the best subject-matter on which to exercise the child at first will be that connected with common every-day knowledge. Speaking broadly, physical science will best supply us with inductive exercises, and mathematics with deductive exercises. In some subjects of the former, such as botany, chemistry, and physiology, his work will be almost wholly inductive: in some of the latter, such as arithmetic and algebra, his work will be almost wholly deductive.

H. COURTHOPE BOWEN.

THE NATURAL METHOD OF TEACHING LANGUAGES.

THE article on "The 'natural method' of language-teaching," in *Science and education* for Dec. 24, closes with the remark that conservatism is not always to be decried, and all innovation is not necessarily good. This thought is so correct that nobody could justly object to it; and, if all other observations made by the opponents of the natural method be of equal soundness, the cause of this

much-discussed method would not seem to be as good as its friends might desire. What evokes, however, the reader's doubt at first, is the high praise lavished upon the old method, with its two mighty cornerstones, — the grammar-book and dictionary. One will naturally ask, If the old and long-established method is really as efficient as its defenders would have us believe, why is it, then, that discontent could arise against it, spreading to the great dimensions of to-day? Why is it that just the graduates of our colleges, who have had the full benefit of the blessings of the old method, speak frequently, with a very significant smile, of their knowledge of modern languages acquired in their *alma mater*? Why is it that men of high standing are protesting against that mode of studying which is in vogue in so many of our colleges and schools?¹ And why is it that the old method, being so strong and good as is claimed, could be shaken in its very foundation to such a degree that one of its warmest defenders writes but lately,² "It is evident to me that the old grammatical method cannot survive the assault of the natural method"?

On the other hand, if the principles of the natural method be as wrong as is said by some of the opponents, it would seem strange that scholars and teachers like Whitney, Thacher, and Hadley of Yale should have permitted their sons to be taught by the founder of the method; that a man like Prof. Dr. Daniel Sanders declares himself for the method;³ that men throughout the country, prominent in their vocation, are favoring the natural method;⁴ and that an educational journal which is not friendly inclined towards the method should have recently been forced to admit that "the subject is now attracting great attention in the secondary and higher schools."⁵

These discussions in educational and other papers furnish occasionally very interesting reading, and recall to one's mind a well-known story about

three professors who were given the task to write the natural history of the camel. None of them had seen the animal, but they set to work at once in the following way: the first one retired to his charming study, and, trusting to his vivid imagination, wrote a history as he thought it ought to be; the second one was busy in the libraries, and, out of all the material collected from books written since the time of Julius Caesar, he gave a natural history of the camel; the third one alone had departed to the country, where he could see a camel and learn something about it, so that his report might be true to the facts. If it so happens that the reader of the discussions referred to is familiar with the working of the natural method, it will be hard to convince him that all who are passing judgment against it could ever have tried the method practically and earnestly, or could even have seen a complete course given.

The question has been raised, 'Is the natural method a method at all?' If it be correct that the term 'method' signifies 'a series of means purporting to lead to some desired end,' then the question must be answered in the affirmative. All the rules of the method pertain either to matter or to the individual.

First, it is required that one should proceed in the treatment of the language and in the treatment of the laws of language; i.e., grammar, in accordance with that method, which, ever since Bacon's time, has been the acknowledged method for true study, — the inductive method.

Second, it is required that the treatment of matter after the inductive method should vary as the individuals who are taught vary in age, character, ability, and preparation.

To fulfil these requirements to the best advantage, it was found necessary to establish the general rule that the language which is to be taught must serve exclusively as means of communication between teacher and learner.

There is nothing especially new in either of these requirements; in fact, one or the other of them has been successfully employed at various periods by different methods: but the united application of them has been first attempted by the natural method; and it is this united application that causes revolution in language-teaching. It is needless to repeat here that the credit of the innovation is due to Prof. Gottlieb Heness of New Haven, Conn. The special training in the principles of Pestalozzi, which he received in the Lehrer Seminar,¹ and peculiar experiences in the teaching of children, had led him to those conclusions with which we are now acquainted. To

¹ D. C. Gilman, president of Johns Hopkins university, writes thus to one of the advocates of the natural method, Aug. 15, 1878: "Many years ago Mr. George Ticknor, while professor of modern languages in Harvard, declared, that, although Americans spent as long a time as Germans in acquiring a liberal education, the results in this country were far inferior to those secured abroad. Other recent writers have illustrated the same point, and have shown how much our deficiencies as an educated people have been due to bad methods of teaching both ancient and modern languages."

² See *The academy* of December, 1886, p. 339.

³ Referring to a certain set of readers prepared for the natural method, the celebrated German grammarian and lexicographer says to the writer of these lines, in a letter dated March 3, 1886, that the method followed therein has his full approval ("dass die darin befolgte Lehrweise meinen vollen Beifall findet").

⁴ See *The natural method*, No. 6, vol. ii., January edition.

⁵ See *The academy* of November, p. 301.

¹ A German institution in which young men are prepared who intend to teach in the public schools.

assume, however, that his method is merely a method for children, because some of his first experiments through which he arrived at certain principles were made in children's classes, is as erroneous as to believe the perusal of the various readers give an insight into the real character of the natural method. Let us now see if the method is capable, in certain measure, of satisfying the demands of the ideal method which the writer of the article in *Science and education* has outlined. The rational method, as he chooses to term the wished-for ideal method, "would take, wherever it find them, all pedagogical methods of undoubted value, and incorporate them in its instruction." This condition, I doubt not in the least, the natural method fulfils well. The writer himself says complainingly in his article, "Since they [that is, the claims of the most enthusiastic votaries of the natural method] were first formulated, the details of the system have grown by a not unnatural accretion, until they include a great mass of pedagogical material, some of which is about as much the especial property of the natural method as spectrum analysis is an individual prerogative of the pupils of Helmholtz. From one point of view, this is, perhaps, not to be deprecated; for, through the active proselytizing of its disciples, sound pedagogical principles have obtained a currency and found their way where otherwise they might not so easily have penetrated."

Then the rational method "would, above all, use the language taught at every possible opportunity, and make its practical acquisition the one end in view." Ever since the natural method has been brought to light, its advocates have preached and practised the rule of using the language taught at every possible opportunity; and some teachers have, in fact, acquired such a skill in using the language taught that they never will use any other while teaching; nor do they lose any more time while explaining or giving definitions than a teacher of the old method would by using English.

Third, according to a rational method, "the grammar and dictionary are effete in modern-language instruction if they are taught for themselves alone." I believe no one has as yet reproached the natural method for having ever taught grammar and dictionary 'for themselves alone.'

Fourth, a rational method would give the good advice, "Regard them [dictionary and grammar] as they should be regarded, as auxiliaries, and employ them in that way." During more than twenty years the advocates of the natural method have been teaching constantly this doctrine, which

their opponents explained in their own way, accusing the method of neglecting the teaching of grammar, while the criticism justly should have been directed against the unthorough, unsystematical, go-as-you-please way of certain teachers they had met with. But, if they had been present for a single hour in a class conducted by the founder of the method, they would have had the opportunity of seeing grammar taught systematically, after the inductive method; and had they asked the question, "Why are the words 'without dictionary and grammar' printed on the titlepages of your books and pamphlets?" they would have received his answer: "If you call this [referring to his teaching the principles of the construction of the language] grammar, you are at liberty to tell the world that I teach grammar." And, indeed, critics should know this, once and forever: the natural method not only teaches grammar, but teaches it more thoroughly than possibly could be done by the old method.¹

Fifth, the rational method "would have extracts furnished at the outset with a special vocabulary which would be learned." Almost every one of the many readers published already for the natural method gives a large supply of such extracts; and they are in some of the best of these readers so selected and arranged that the words must necessarily impress themselves on the student's mind without any memorizing at all.

Sixth, "later on" the rational method "would inculcate the use of the dictionary." The natural method is always ready to comply with this demand, though it must respectfully decline to take a text-book of grammar as a 'cornerstone;' and, in this view, it has on its side the opinions of learned men of various times.²

A great deal has been said of late about the

¹ See 'A plan for twenty-eight lessons for the class in French,' or 'Program of October, 1886,' both published by Stern's School of languages of New York City.

² "One can learn the grammar from the language, and not the language from the grammar."—JOHANN GOTTFRIED VON HERDER.

Prof. Rudolph Hildebrand, editor of the great German dictionary begun by Grimm, says in 'Vom deutschen Sprachunterricht in der Schule,' "Der Lehrer des Deutschen sollte nichts lehren was die Schüler selbst aus sich finden können."

"One should begin with the spoken language with sentences, and from the audible language one should proceed to written language. Reading must be considered as the centre of language-teaching, and in connection with it grammar must be taught inductively: the learner must be guided so as to find for himself the laws of language."—*Internationale Zeitschrift für allgemeine Sprachwissenschaft*, band II. heft 1. (Leipzig).

"The language is not to be learned from the grammar, but from and through the language."—SCHRADER, vii. p. 241.

"The grammar must not precede, but follow."—GRAF VON PFEIL, in *Wie lernt man eine fremde Sprache*, p. 31.

name 'the natural method,' and of the success being due to that name. For those who lay so much stress on the name, it will be interesting to learn that neither the founder of the method, nor some of the most prominent exponents, had any thing to do with the giving of the name. One of Harvard's learned professors has done the method the honor to christen it; and a research after the true motives for selecting just that name, with all its meanings, is certainly a worthy subject for investigation. But to attribute the popularity of the method solely or mostly to its name, seems hardly to be reasonable. To my judgment, it is the truth of the method, the zeal and energy of its followers, and the much-felt need of better methods in general, which explain the conquering power of the natural method.

SIGMON M. STERN.

THE TRAINING OF TEACHERS.¹

THE profound significance of the teacher's profession is not yet properly recognized. Many men, of considerable intelligence even, think that school education covers too narrow a field of life to have facts and principles capable of constituting a science, and that teachers of common schools are but day-laborers, having no professional standing, and hence needing no professional training. On this account, our normal schools will have many trials to meet, and many difficulties to overcome, before reaching the position towards which they are struggling.

As yet, our advanced high schools and colleges do not supply these schools with a sufficient number of students whose thorough literary attainments warrant a more exclusively professional course of studies. In fact, our normal schools are necessitated to do this preparatory academic work themselves. In this way they render themselves liable to the charge of being only academies with a quasi-professional annex.

We have all along very much regretted the necessity of directing so much attention to the academic training of the students in these schools, and have carefully studied how to keep the purely professional element from being too much neglected, without, at the same time, sacrificing the thorough literary instruction required.

The large supply of teachers required for the educational work of the state, and the very low average of salaries given for educational labor, make it almost impossible to lengthen very much the present term of study. Some, with great earnestness, have advocated the addition of an-

other year. In due time this will come, and be of immense account in enlarging the sphere of professional studies, and giving opportunity for more definite and continuous model practice, which, when rightly conducted, is of so much value.

The literary instruction may have been given in harmony with the best principles which the present philosophy of school education is able to give, and in such form as to bring into view the very best methods which either the science or art of teaching furnishes. We are not calling this in question at all; but we must keep in mind that the students, at the very outset, are backward in their literary studies, and have but little knowledge of psychology. Hence they are forced to make every exertion in preparing for their daily class-work, and must be, of necessity, far more anxious about the matter of what is taught than about the manner or method of teaching it. They fear to spend any more time in the model school than is absolutely required by law. They make the minimum here the maximum, if they can. In addition to this, being subject at the close of the course to a rigid state examination, covering all the academic studies pursued, they, with their professors, are tempted to sacrifice all efforts towards enlarging the course of professional studies through fear of the issue of the final examination-test.

Although the course of studies as now arranged is not very satisfactory to us, and will need, in our judgment, some important changes, yet we have felt constrained to approve it on account of our great anxiety that the graduating year should be given more fully to the work of professional training, taking up the whole history and science of school-teaching, and illustrating in detail the psychological ground of every method by a greatly enlarged course of practice in the model school. Such practice, in our judgment, is very essential. Indeed, it sustains the same relation to the normal-school studies as a moot-court does to a law-school. Here theory finds verification; here principles pass into direct conscious application; here science makes its transition to art; here the furnished scholar learns to handle with vigor his whole armor, as a page when he became a belted knight and entered the tourney. The teacher needs scholarship, of course, but he needs something more: he must have knowledge, and, at the same time, thoroughly master the art of imparting it. To this end our normal schools were established; in this direction they steadily tend. In the above plan, however, no one thought for a moment of not holding with firm grasp the essential truth that professional knowledge cannot exclude schol-

¹ From the annual report of E. E. Higbee, superintendent of public instruction of the state of Pennsylvania.

arship. Evidently, he who knows not the subject to be taught can never be a master of the method of teaching it.

It is plain that all our teachers cannot have the benefit of a professional training in our state normal schools. The number is too great for us to expect this. It is important, therefore, that they use every opportunity within their reach to advance their professional zeal and skill. Well-conducted teachers' institutes are exceedingly valuable for this purpose; indeed, in our judgment, indispensable. It is not out of place here to mention in brief some of the benefits derived from these institutes. Teachers, especially in our country districts, are much isolated. They need the inspiration gained from association. Engrossed with their daily routine of labor, and deprived of all chance of any frequent consultation with others of their own vocation, their work is in danger of becoming a monotonous task, lacking all incentive to that professional zeal which prompts to new exertion and sweetens every toil. These yearly conventions serve, in a great measure, to keep up the *esprit de corps*, and to give rest and recreation so much needed and so valuable, while each teacher feels the support of, and enjoys communion with, the profession at large. Again, by means of the pointed instruction of experienced educators, many difficulties are removed, better methods suggested, troubling mistakes corrected, false tendencies thwarted, and new inspiration aroused. Through valuable lectures and addresses, educational interest is awakened, and the warm sympathy of large communities gained in behalf of the schools. Parents and teachers and directors come face to face, and the duties and responsibilities of each are more clearly understood. It would be a fatal mistake not to encourage these institutes in every possible way.

LUDWIG WIESE.

IN his review of Wiese's *Lebenserinnerungen u. Amtserfahrungen*, published in the *Berliner philologische wochenschrift*, Professor Paulsen pays a warm tribute to Wiese's character and pedagogical work. He describes Wiese's life as that of a healthy, strong, enthusiastic, frank, and self-confident personality, and calls his life a rich and happy one in the true sense of the Aristotelian definition. Wiese was born at Herford in 1806, and from 1826 to 1829 studied theology and philology at the University of Berlin. His activity as a teacher began in the Friedrich-Wilhelms gymnasium, and in 1831 he was called as con-rector to the gymnasium at Clausthal. In 1837 he accepted an appointment at the celebrated Joachimthal-

isches Gymnasium, and worked there until he was appointed to an office in the ministry of education in 1852. Wiese's early teaching pointed out for him the demands of sound methods of instruction. He himself says, "The perception that the majority of the pupils understood the rules as laid down only with much difficulty, suggested to me to begin with the demonstration of an example, letting them discover the rule for themselves from it. Such examples as commended themselves as suitable for this process I brought together as *Normalsätze*, and, having dictated them to the pupils, caused them to be learned by heart; which was done willingly and easily. The result was surprising, and the written themes soon showed a pleasing correctness. It was the beginning of a grammar invented from examples." While a teacher at the Joachimthalisches Gymnasium, Wiese made a journey to Italy and one to England. The letters which he wrote home to a friend about the English educational establishments were published as 'German letters about English education.' In 1852 he was intrusted by Minister von Raumer with the supervision of the secondary school organization of Prussia, and for twenty-three years he held this office under four successive ministers of education. In 1875 the governmental policy of *Kulturkampf* brought about his resignation. The two aims of Wiese's official life were, first, the confining the curricula of the gymnasia within proper bounds; and, secondly, the restoration to the gymnasia of the former Christian character. Professor Paulsen's estimate of Wiese's influence is kindly but cautious, and it probably well represents the esteem in which the veteran educator is held in his native land.

THE SIGNIFICANCE OF GEOGRAPHICAL NAMES.

THE importance of geographical names in connection with the teaching of history and philology is almost entirely overlooked by teachers. These subjects acquire an added interest if linked together in this way, and details are better retained in the memory if provided with these associations. The following account of the word 'Donau' is translated from the *Zeitschrift für das realschulwesen*, and serves as an example of how history, geography, and philology may be connected in teaching. The points of contact, and the lines in which they can be developed, are apparent.

The Greeks (Herodotus, ii. 33) applied the name 'Donau' (Greek, 'Istros'; Roman form, 'Ister' or 'Hister') to the entire stream, and used it almost exclusively, though their later authors

also knew of the the Celtic name, 'Danuvius,' which had become known to the Romans. The Greeks learned the name 'Istros' from the Thracians, and applied it as the general name for the river, from the point where the stream issued from the mountains as far as the Thracians occupied its banks. Yet it does not follow necessarily that the name 'Istros' is of Thracian origin, as it may have been used still earlier by the ancient Illyrians who inhabited that country. It is traceable, probably, to the Aryan root *srū* ('to flow'), from which is also derived the name 'Strymon.'

'Danubius' or 'Danuvius' is the Latinized form of the Slavic name, from which *don* is derived, and which in composition becomes *dan*. Anciently this Latinized name was only used for the middle part of the stream. The Slavic root *don* ('water, river') appears in the names of many other rivers: for example, Don, Dwina, Dniester, Dnieper, and so forth. In the 'Nibelungenlied' the Donau is called Tuonowe, that is, the river Tuon. To the name 'Don' the German *aha*, *aa* ('river'), is added, and in the sixteenth and seventeenth centuries the forms Dunaw, Tonaw, Donaw, first appear.

THE STUDY OF BROWNING.

THERE can be no question that the picking-apart process to which, under the exigencies of instruction in grammar and parsing, Milton and Shakspeare, Addison and Macaulay, are alike subjected, is an evil. It may or may not be a necessary evil: if it is, its effect should be subsequently counteracted as far as possible; if it is not, it should be done away with. The pupil who is always on the lookout for inverted sentences, modifying clauses, and auxiliary verbs, cannot appreciate the literary beauty of an author; and so it seems to us that the elementary details of grammar and the exercises for parsing might profitably be based on something less lasting and beautiful than the classics of the language. These details to which we have reference must undoubtedly be mastered; but could they not be mastered from current literature, reserving the classics for models of style and diction, and for the cultivation of a refined literary taste and a sound literary judgment?

If this dissection of the classics is a necessary evil, then great care should be taken to follow it up in the higher grades with the reading of a series of authors, such as Chaucer, Spenser, Shakspeare, Milton, Hooker, Addison, Steele, Burke, Macaulay, Tennyson, Browning, and their fel-

lows, not with a view to parsing them correctly, but with the endeavor to understand and appreciate them. Professor Corson has given us a book on his hero, which would serve excellently for the purpose we have indicated.

Mr. Browning has his critics, but few poets have been favored during their lifetime with so numerous and energetic a body of devoted students and admirers as he has, both in this country and in England. Of these, Professor Corson is among the most enthusiastic; and his personal work, and the interest excited by his lectures, have led to the formation of many of the Browning clubs now at work throughout the United States. In the present work, he has given students of English literature an example of what we referred to above as the real end to be gained by the study of a great poet or prose writer. We do not want to parse 'Paracelsus,' 'Andrea del Sarto,' and 'Rabbi Ben Ezra,' but we want to read them to discover the thoughts they convey and the feelings they portray: in other words, we want to study them as literature; and this is precisely what Professor Corson's book helps us to do. His admiration for Browning is well-nigh unbounded. For example: he says, "Robert Browning is in himself the completest fulfilment of this equipose of the intellectual and the spiritual, possessing each in an exalted degree; and his poetry is an emphasized expression of his own personality, and a prophecy of the ultimate results of Christian civilization" (p. 31). "It was never truer of any author than it is true of Browning, that *Le style c'est l'homme*; and Browning's style is an expression of the panther-restlessness and panther-spring of his impassioned intellect. The musing spirit of a Wordsworth or a Tennyson he partakes not of" (p. 75). The criticism so often made, that Browning's style is involved and obscure, Professor Corson notices, and attempts to answer. He says that a truly original writer like Browning is always difficult to the uninitiated, and that the poet's favorite art-form is also somewhat of an obstacle to the beginner. This art-form is, of course, the 'dramatic or psychologic monologue,' which differs from the soliloquy, as Professor Johnson (quoted by the author in a footnote, p. 85) has pointed out, in supposing the presence of a silent second person to whom the arguments of the speaker are addressed. In addition to these characteristics and to his peculiar collocations of words, Professor Corson finds four peculiarities of Browning's diction which are by some readers held to render him obscure. These are, 1°, the suppression of the relative, whether nominative, accusative, or dative; 2°, the use of the infinitive without the preposition *to* in cases not warranted

by present usage; 3°, the use of the simple form of the past subjunctive derived from the Anglo-Saxon inflectional form and identical with that of the past indicative, instead of the modern analytic form; 4°, the use of the dative or indirect object without *to* or *for*. But Professor Corson hesitates to condemn even these: he thinks that "they often impart a crispness to the expressions in which they occur" (p. 81). At all events, they render Browning's thoughts less accessible to the general reader than they might otherwise be. Professor Corson's essays on the idea of personality, and of art as an intermediate agency of personality in Browning, on Browning's obscurity and his verse, and his analytic arguments of the poems that are appended, are very suggestive, and will repay not only reading, but study.

COMPAYRÉ'S ELEMENTARY PSYCHOLOGY.

M. COMPAYRÉ is so well known to students of pedagogy, and Professor Payne's translation of his 'History of pedagogy' has had so favorable a reception in this country, that his present book on psychology, and that on ethics, promised in March, will attract considerable attention.

In the little book now before us, the author, with the skill and lucidity of a true Frenchman, sketches the main topics of elementary psychology. M. Compayré begins by expounding in a few brief paragraphs the character and utility of psychology, and its relations to ethics, pedagogics, history, grammar, and literature. In speaking of the method of psychology, he mentions the distinction, so generally overlooked, between the scientific study of psychology and the elementary teaching of it. M. Compayré remarks that we do not confuse an historian and a teacher of history, and complains that authors of text-books of psychology should preserve a similar distinction in their science (p. 11).

In touching on the relations of psychological to physiological facts, he finds three points of difference between them (pp. 32, 33). First, the two categories of phenomena are not known in the same way. Second, the physiological phenomena are material movements: the psychological phenomena are something else than material movements. Third, the two sets of phenomena are in a certain sense independent of each other.

Then, accepting the usual classification of mental phenomena into those of knowledge, feeling, and will, M. Compayré enters upon the discussion of each. We can best represent his positions by quoting some brief passages dealing with controverted points in psychology: "De plus en plus,

Notions élémentaires de psychologie. Par GABRIEL COMPAYRÉ. Paris, Delaploue, 1887. 16°.

le mot âme est devenu synonyme de *principe spirituel*, qui sent, qui pense et qui veut" (p. 39); "La sensibilité, sous toutes ses formes, peut être définie *la faculté d'éprouver du plaisir et de la peine, et par conséquent d'aimer et de haïr*" (p. 55); "Ces principes constituent ce qu'on appelle la *raison*, c'est-à-dire tout ce qui est inné à l'intelligence, par opposition à l'*expérience*, c'est-à-dire à tout ce qui est acquis" (p. 74); "La *raison*, au sens psychologique, est l'ensemble des notions et des vérités qui ne dérivent ni de l'expérience ni des combinaisons de l'expérience" (p. 189); "Les vérités de la raison sont innées en ce sens qu'elles préexistent à l'expérience comme autant de dispositions naturelles; mais l'expérience est nécessaire pour les développer et les déterminer" (p. 191).

The value of the work as an elementary text-book is enhanced by the brief *résumés* given of each chapter, and by a lexicon of proper names and technical terms used in the book. Should the book be translated into English, as we understand is contemplated, it would be a decided addition to our elementary works on psychology.

PAYNE'S CONTRIBUTIONS TO THE SCIENCE OF EDUCATION.

PROFESSOR PAYNE'S volume of essays might, we suppose, following Max Müller's precedent, be entitled 'Chips from a Michigan workshop.' They are very plainly the results of the thinking done by the author on the educational problems suggested by his daily work. The first question we are tempted to ask is, Will they do any good? It must be remembered that a volume of this sort reaches a class of readers who are already more or less imbued with the author's views. It comes to them as a word of cheer and encouragement. But we should like to hear that Professor Payne's essays were reaching the indolent, untrained teacher, who believes that general information — and not too much of that — is the only preparation necessary for the teacher; and the loquacious and sarcastic sceptic, who has no trouble at all in proving — to his own satisfaction — the theorem that there is and can be no such thing as a science of education. We do not mean to say that Professor Payne's book would thoroughly arouse and convert such readers, for it is a trifle heavy, and conspicuously lacking in a certain attractiveness in style and arrangement that goes far to make a book successful; but it certainly would open up unknown regions to them, and stimulate further thought and inquiry. With the question, Is there

Contributions to the science of education. By WILLIAM H. PAYNE, A.M. New York, Harper, 1886. 12°.

a science of pedagogics? the author grapples at the outset; and while he reaches an affirmative answer, which we believe to be the proper one, he does so in a ponderous and not very direct manner. The following chapters, some of the titles of which are 'The science of education, its nature, its method, and some of its problems,' 'Contribution to the science of education values,' 'The mode of educational progress,' 'The potency of ideas and ideals,' 'Lessons from the history of education,' 'The secularization of the school,' 'Teaching as a trade and as a profession,' 'Education as a university study,' 'The institute and the reading-circle,' offer us excellent samples of what the scope of pedagogics is; for its points of tangency with psychology, ethics, and history, as well as the fact that it includes both theory and practice, are all indicated. Professor Payne says so much and on so many subjects, that we can best give an idea of his thought and method of treatment by letting him speak for himself. For example: in protesting against the erection of infant psychology, and therefore infant education, into a science apart, he says:—

"I am very far from denying that there are differences between a child's mind and a man's mind; but I insist that these are differences in *degree* or *power*, and not in constitution. It is freely admitted that these differences in power should be observed and heeded, and that mothers and nurses may do some real service by their registration of the phenomena of infant life. What I protest against is the present tendency to exaggerate these differences, and to assume that the child's education must be considered quite apart, as though he were a being *sui generis*. I venture to express the belief that one of the most serious errors in primary teaching arises from an exaggerated notion of the differences between child mind and mature mind. Some observed difference furnishes the devoted enthusiast with a clew; and then this clew is followed up so persistently, and so far, that one section of the child's mind is aroused to preternatural activity, while another section lies unused and torpid. It is observed, for example, that the sense activities predominate in childhood. The teacher lays hold of this clew, and there is such a persistent and copious feeding of the senses, that the physical section of the child's mind becomes abnormally active, and the intellectual section as abnormally inactive. It would seem to me a great gain if there were to be a return towards the older conception that the child and the man are essentially one, and that for infancy, childhood, and youth, there should be considerable sameness in instruction" (p. 19).

"The accomplished teacher should be a man of

science in the sense that the accomplished physician is a man of science. I am persuaded that the motive which most attracts minds of the higher order into certain vocations is the opportunity for the free exercise of tact, talent, ingenuity, invention, discovery, and all the resources of a well-stored and well-disciplined mind. Minds of the better order love to take chances, to run risks, to anticipate the new, and to compass by sagacity some victory over danger and difficulty. To all such minds, the possibility of achievement is an inspiring motive of the highest order" (p. 291).

"The manifest tendency of the times is towards the secularization of the school. The modern state has become an educator, and relegates religious instruction to the family and the church" (p. 216).

Lack of space forbids our quoting further, but we recommend Professor Payne's book to all who can appreciate earnest thought on educational subjects.

DAS VOLKSSCHULWESEN IM PREUSSISCHEN STAATE.

If the three large volumes of the compilation of Schneider and von Bremen, of which the first is before us, are provided with a good index, they will be invaluable for the student of the Prussian educational system and its development. If the index should be wanting, or not thoroughly made, the immense amount of material contained in the volumes will be effectually buried. The first volume is a large octavo of nearly a thousand pages, and contains the official regulations regarding "die Stellung der Behörden und Beamten, die Ausbildung und die Stellung des Lehrers;" and it is safe to say, basing the assertion on such an examination as we have made of the book, that not a single point is left untouched. The second volume will treat of "die Organisation und Verwaltung der Schulgemeinde;" and the third, of "die Schulpflicht, der Privatunterricht, die Schulzucht, der Unterricht in den verschiedenen Volksschulen." Our information about the secondary schools and universities of Germany is usually more full and explicit than that concerning the popular schools; but, with this work of reference at hand, we need no longer be in ignorance of the minutest detail concerning the latter. It must be borne in mind, too, that the official organ of the ministry of public instruction in Prussia, the *Centralblatt für die gesammte Unterrichtsverwaltung im Preussen*, is in

Das Volksschulwesen im preussischen Staate, in Systematischer Zusammenstellung der Gesetze und Verordnungen, etc. Compiled by Dr. K. SCHNEIDER und C. VON BREMEN. Berlin, Hertz, 1886. 8°.

its twenty-seventh year of publication, and that it is difficult, if not impossible, to procure the earlier volumes. The present work, by reason of its having used the material of the *Centralblatt*, serves as a substitute for the first twenty-six volumes of the latter, and is therefore especially to be recommended to libraries which have not a set of the *Centralblatt*.

The school-laws are here codified according to their place in the system, and not chronologically, which is an undoubted gain, especially to the foreign reader; and, as the dates of the various laws are always appended, nothing is lost by the change. As is the case with most compilations of this character, we are obliged to read a great deal that we care nothing about in order to reach the data of which we may be in search. But we should be willing to put up even with German prolixity and minuteness in order to gain so indispensable a work of reference as this is.

DAWSON'S ZOÖLOGY.

ONE dislikes to severely criticise a book bearing on its titlepage such a widely and justly honored name as that of Sir J. W. Dawson, and yet it is difficult to see what good purpose is to be served by this work. The author sets forth his object as, "to furnish to students, collectors, and summer tourists in Canada, an outline of the classification of the animal kingdom, with examples taken, as far as possible, from species found in this country." From the footnote on p. 6, it would also seem that it is intended as a text-book. Eighteen small pages are devoted to a consideration of the animal tissues and functions, twelve more to the subject of classification in general, and the remainder of the book to 'descriptive zoölogy.' As may be inferred, the account of the tissues, etc., is very inadequate; and such a statement as that protoplasm is albumen (p. 6.) does not tend to give confidence in the accuracy of the work. There is not a satisfactory account given of the structure of any single animal or group: the most important thing to be learned of an animal would seem to be its name, and the name and definition of the group to which it belongs. Nor are the views of classification, in some cases, such as will find general acceptance among naturalists.

As a text-book, this work will not, we fear, prove satisfactory; the amateur will not find it easy to identify his collections by its aid; and, while there may be in it "many facts derived from original observation, and not otherwise ac-

cessible," it is not likely to become a valuable help to the specialist.

The illustrations are in most cases badly executed and sometimes misleading.

DR. WASHINGTON MATTHEWS, surgeon in the U. S. army, has made a valuable contribution on the causes which are at work in carrying off the Indians of our country. One of the most important of these he finds to be consumption. From the census of 1880 we learn, that, while the death-rate among Europeans is 17.74 per thousand, and that among Africans 17.28, the rate among the Indians is no less than 23.6. In diarrhoeal diseases the Indian death-rate is not greatly in excess of that of the other classes. Measles gives a mortality of 61.78 per thousand. But it is under the head of consumption that the difference between the Indians and the blacks is most conspicuous; the rate among the former being 286 as compared with 186 among the latter, while among the whites it is but 166 in the thousand. Dr. Matthews finds, that, where the Indians have been longest under civilizing influences, the consumption-rate is the highest; meaning by the term 'consumption-rate' the number of deaths from consumption in a thousand deaths from all known causes. Thus the rate among reservation Indians in Nevada is 45; in Dakota, 200; in Michigan, 333; and in New York, 625. The evidence appears to show that consumption increases among Indians under the influence of civilization,—i.e., under a compulsory endeavor to accustom themselves to the food and the habits of an alien and more advanced race,—and that climate is no calculable factor of this increase. It is a general supposition on the frontier that it is change of diet which is the most potent remote cause of consumption among the Indians. Dr. Matthews says he once knew of a previously healthy Indian camp of about two thousand people, where, in one winter, when the buffalo left their country, and they subsisted on flour and bacon furnished by the government, the majority were attacked by scurvy, and about seventy died of the disease. It is, however, also ascertained that the consumption-rate is high at agencies where the supply of beef is liberal, and, as has already been said, especially high among the Indians of New York and Michigan, whose diet is by no means a restricted one. It is evident that the true explanation for this remarkable predisposition of the red-man to pulmonary tuberculosis has not yet been given, and that a fruitful field is open to those whose qualifications and tastes lead them into such investigations as these.

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 How I was educated. James B. Angell. *Forum*, January.
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[A notice of the government document on this subject, prepared by Mr. J. E. Clarke.]

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[This article closes the discussion as to the extent and merits of the elective system, introduced by Professor Palmer a year ago.]

Present position of philosophy in Britain, the. Henry Calderwood. *New Princeton review*, January.

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 KING, M. Harvard and its surroundings. 7th ed. Boston, Rand Avery company. 102 p. 16°.
 MARTIN and WETZLER. The electric motor and its applications. New York, Johnston. 208 p. 10°. \$3.
 MASSACHUSETTS fish and game commissioners, report of, for year ending Dec. 31, 1886. (Pub. doc. No. 25.) Boston, State. 91 p. 8°.
 PHILBRICK, P. H. Beams and girders. New York, Van Nostrand. 159 p. 24°. 50 cents.
 SCHWATKA, F. Report of a military reconnaissance in Alaska, made in 1883. Washington, Government. 121 p. 8°.
 SECULAR thought. Vol. 1. No. 1. Toronto, Charles Watts. \$2.
 U. S. NAVAL academy, Annapolis, Md., annual register of, 1885-86. Washington, Government. 70 p. 8°.

- U. S. NAVAL advisory board, report of, on mild steel. Washington, Government. 216 p. 8°.
- department. Annual report of the hydrographer to the bureau of navigation for the year ending June 30, 1886. Washington, Government. 51 p. 8°.
- U. S. SENATE. Report of the select committee on ordnance and war ships, with appendix. Washington, Government. 512 p. 8°.
- WHITNEY, W. D. Practical French grammar. New York, Holt. 442 p. 12°.

Calendar of Societies.

Philosophical society, Washington.

Jan. 15. — G. K. Gilbert, The graphic method in research; C. D. Walcott, Geologic age of the lowest formation of Emmons's Taconic system; H. A. Hazen, The sky glows of 1883; H. A. Hazen, Lunar atmospheric tides.

Jan. 22. — F. W. Clarke, Present status of mineralogy; R. T. Hill, The topography and geology of the cross timbers of Texas.

Chemical society, Washington.

Jan. 13, election of officers for 1887. — President, Prof. E. I. Fristoe; vice-presidents, Prof. F. W. Clarke and Dr. J. H. Kidder; treasurer, Prof. William H. Seaman; secretary, Dr. A. C. Peale; members at large of executive committee, Mr. Edgar Richards, Prof. H. W. Wiley, Mr. J. S. Diller, Prof. Thomas Robinson.

W. H. Seaman, Models of molecular structure.

Biological society, Washington.

Jan. 22. — G. Brown Goode, The beginnings of natural history in America: the third century.

Natural science association, Staten Island.

Jan. 8. — Mr. Gratacap, Drift fossils of Staten Island; W. T. Davis, Short account of two interesting insects from the island.

Torrey botanical club, New York.

Jan. 11. — Dr. Britton, Curtis's latest fascicle of southern plants; H. H. Reesby, Botanical notes from South America.

Annual meeting, election of officers. — President, Dr. J. S. Newberry; vice-president, Thomas Hogg; treasurer, F. J. H. Merrill; recording secretary, Arthur Hollick; corresponding secretary, Miss H. C. Gaskin; curator, Miss M. O. Steele; librarian, Dr. N. L. Britton; editor, Elizabeth G. Britton; associate editors, F. J. H. Merrill, Jos. Schrenk, H. H. Reesby, C. H. Kain.

Connecticut academy of arts and sciences.

Jan. 19. — J. W. Fewkes, Is the vast mass of oceanic water, between the surface and bottom, barren of life, or occupied by a peculiar fauna?

New England meteorological society, Boston.

Jan. 18. — G. L. Goodale, Some supposed relations between forests and atmospheric ozone; F. V. Pike, Comparisons of rain-gauges at Newburyport; W. M. Davis, Winter temperatures about Mount Washington.

Society of arts, Boston.

Jan. 20. — Edward Burgess, The evolution of the modern yacht.

Society of natural history, Boston.

Jan. 19. — J. S. Kingsley, Arthropod development.

Advertised Books of Reference.

THE STANDARD NATURAL HISTORY. By all the leading American scientists. Edited by J. S. Kingsley, Ph.D. Vol. I. Lower Invertebrates. Vol. II. Crustacea and Insects. Vol. III. Fishes and Reptiles. Vol. IV. Birds. Vol. V. Mammals. Vol. VI. Man. 6 vols., nearly 2,500 illustrations and 3,000 pages. Imp. 8vo, cloth, \$36.00; half morocco, \$48.00. S. E. Cassino & Co. (Bradlee Whidden), Publishers, Boston.

THE BUTTERFLIES OF THE EASTERN UNITED STATES. For the use of classes in zoölogy and private students. By G. H. French, A.M. Illustrated by 93 engravings and a map of the territory represented. Large 12mo. Cloth. \$2.00. J. B. Lippincott Company, Pubs., Philadelphia.

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MANUAL OF THE BOTANY OF THE ROCKY MOUNTAINS. Coulter (Wabash Coll.), 8vo., 49 pp. \$1.85. Ivison, Blakeman, Taylor & Co., Pubs., New York.

STRUCTURAL BOTANY; or, Organography on the basis of Morphology; the principles of Taxonomy and Phytography and a Glossary of Botanical terms. Gray (Harvard), 8vo., 454 pp. \$2.30. Ivison, Blakeman, Taylor & Co., Pubs. New York.

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